MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Is there more to MORE! Cyber Homework?“

verfasst von / submitted by

Benjamin Würfel, BEd

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Education (MEd)

Wien, 2020 / Vienna 2020

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	UA 199 507 525 02
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Lehramt Sek (AB) Lehrverbund, UF Englisch, UF Psychologie und Philosophie
Betreut von / Supervisor:	Univ.-Prof. Mag. Dr. Julia Hüttner, MSc

Acknowledgements

Above all, I would like to thank my parents, my girlfriend and my friends for their unceasing support throughout my studies and especially during the writing process of this master's thesis. I highly appreciate all the help and encouragement I received, especially in times of need or when I felt overwhelmed and exhausted.

I would also like to express my gratitude to my research supervisor Univ.- Prof. Mag. Dr. Julia Hüttner, MSc for enabling me to write about this research topic in these exceptional times. I enjoyed the working atmosphere and have always received valuable input and feedback for my questions.

Furthermore, I would like to show my appreciation to all the people that showed interest in my topic and made the conduct of my empirical study possible.

Table of Contents

1. Introduction

In the year 1997, the American computer entrepreneur Bill Gates voiced a very suitable observation which can be utilised as a starting point for the following master's thesis (Ratcliffe, 2016):

> *Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important.*

It sets the tone for an investigation of the modern classroom and of the question whether the teacher is still the most important factor. This quote, undeniably, dates back more than twenty years during which countless technological breakthroughs have been made. Several of these also have found their way into the classroom and exert motivational and organisational effects that can fundamentally change teaching. One of these phenomena is made possible only via the wide availability of computers, both in school and particularly at home. It transforms an almost traditional constituent of teaching, namely homework, into a new form of working and engaging with learning materials. Especially in recent years online homework systems have seen a lot of attention if various in educational contexts.

The present thesis aims at investigating the theory behind the employment of a digital homework system in the classroom and its effects on the students. This research has been initiated by the rather recent demands of the Austrian curriculum (since schoolyear 2018/19) that *Basic Digital Education* ("Digitale Grundbildung") is to be a mandatory part of teaching. For that purpose, the widely utilised and commonly known schoolbook *MORE!* (Gerngroß, Puchta, Holzmann, Stranks, & Lewis-Jones, 2016) will be critically analysed according to its qualities regarding this aspect. Above all, the supplementary online learning platform *e-zone* and the corresponding *Cyber Homework* will be in the focus of investigation. In this context, it is appealing to explore how students of different age groups think of this online homework system as part of their regular class work in the subject of English.

Thus, the underlying aim of this thesis is twofold. First, it seeks to reveal in how far *MORE! Cyber Homework* can be considered to be supporting the recent demands of the Austrian

curriculum and, second, it empirically examines the various claims voiced about the beneficial effects on organisation, motivation and student engagement.

The first chapter forms the conceptual basis for the following investigation and develops a suitable definition for the important concept of *digital competence*. Furthermore, the constantly changing and advancing nature of technology is discussed as a reason for the integration of digital education in schools.

Chapter three deals with the current situation of digital education in Austria. The idea of *Schule 4.0* and the four corresponding constituents, for example *Basic Digital Education* and digitally competent teachers, are extensively discussed. Additionally, the schoolbook series *MORE!* is mentioned in the context of these developments and its overall stance concerning competencies postulated by the curriculum is described.

Chapter four turns to the theoretical background for an employment of an online homework system. Potential costs and benefits are explained, with a focus on organisational, as well as motivational effects. In addition, an inherent drawback to the use of digital media in the context of education is identified in the concept of *digital exclusion*. Here, possible strategies to cope with this problem are brought forward.

Chapter five is mainly represented via the empirical research project. Topic of investigation, research design, methodology of data acquisition are each presented and should allow for a better contextual understanding of the results generated in the next chapter.

Chapter six displays the acquired results in a structured and comprehensible manner. The organisation follows the previously established sequence to guarantee a better understanding in relation to research questions, as well as formulated hypotheses.

In chapter seven, these results are discussed extensively and brought into connection to central ideas from the theoretical framework. Vital connections and findings are highlighted, and deductible explanations are presented. Additionally, several remarks about the relevance of significant findings are specifically mentioned for teachers that already utilise or want to utilise *MORE! Cyber Homework*.

The most important results of the thesis are synthesised in the final chapter and ideas for further research concerning this topic are presented.

2. Digital Competence

In a first step, the essential concepts of competence, as well as digital competence have to be defined in order to set the stage for the research topic of this thesis and outline a basis for following elaborations. Although the superordinate term of competence is often mentioned and discussed, especially in the context of education, the perception of the notion is manifold. Ilomäki et al. (2011) emphasises that competence, even though regarded as closely related, is more than just an individual skill or a set of skills. The OECD (2005, p. 4) very fittingly defines competence and its relation to the concepts of skill and knowledge: “A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilising psychosocial resources (including skills and attitudes) in a particular context”. In other words, competence is not only evident in action, but likewise in connected cognitive and emotional dispositions that accompany such an action. To underline this idea, the OECD (2005) brings forth the example of an individual’s effective communication with others, which draws on knowledge of language, skills in producing and conveying a message, as well as attitudes towards the receiving party. Although the necessary components that make up the competence of an effective communication are illustrated here, these cannot be considered to cover all aspects of this competence for every already existing and future context. Slight circumstantial changes alter the conditions for such an endeavour and thus influence what skills, knowledge, attitudes or dispositions are needed for effectively communicating with other people.

What becomes obvious via this insight is that people “need a wide range of competencies in order to face the complex challenges of today’s world […]” (OECD, 2005, p. 4). Still, it would not be practical to list everything that people might or might not have to do in given contexts, because of the sheer endless possibilities. Furthermore, these situational demands are likely to change over time and thus require the individual to adapt to the new structures, which for example can be initiated via technological advances and progress.

Hence, a justified observation can be made about the time of adaption and acquisition of competencies. An individual's development of competencies does not stop at any given time, but continues throughout life. This notion is closely related to the idea of lifelong learning. As people grow older, however, there is not only the possibility to acquire new competencies, but lose those that are no longer needed (OECD, 2005).

In recent years, modern developments and globalisation "are creating an increasingly diverse and interconnected world" (OECD, 2005, p. 4), with new advancements in technology playing a role of paramount importance. More and more people are utilising digital technologies for an increasing number of activities and, thus, also for a rising number of purposes (Ferrari, 2012; Hutchison et al., 2012). This naturally creates a necessity of new competencies in this context. Hutchison et al. (2012, p. 78) very fittingly observe that "[a]s society is becoming digitalized, the competences needed are becoming manifold". Hence, the concept of digital competence has emerged, which entails all aspects that are significant for dealing with increasingly digitally driven actions and possibilities of today. In a recommendation by the European Parliament and the Council for key competences in lifelong learning, digital competence is identified and defined as follows:

> Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet. Digital competence requires a sound understanding and knowledge of the nature, role and opportunities of IST in everyday contexts: in personal and social life as well as work (European Union, 2006, p. 15).

Granting that this comprehensive definition was written more than decade ago, it still gives a fitting insight into the scale of factors entailed in this competence. It is highly debated and expressed differently in respective frameworks (Hutchison et al., 2012). Also Ilomäki et al. (2011, p. 8) state that although resembling a core competence, "it is not yet a standardized concept". Still, Ferrari (2012) is able to synthesise three crucial aspects that are evident in almost all theories, namely knowledge, skills and attitudes. The first,

knowledge, encompasses an understanding of important applications, of risks that are connected to online communication and the Internet as a whole, of the reliability and validity of accessible information, as well as of underlying ethic and legal principles. The second, skills, relates to people's ability to manage information, to use technology efficiently also in connection to creativity and critical thinking, and the capacity to tell the difference between the virtual and the real world and thereby identify points of contact between the two. The third aspect, attitudes, refers to the necessity of digital users to be critical and reflective toward information that is provided online, and to see themselves as responsible users when engaging with digital media (Ferrari, 2012). It has to be remembered that these descriptions only function as an outline for the three aspects of digital competence and therefore mainly help to understand the overall concept.

For a further explanation of digital competence the often synonymously used term of digital literacy must be mentioned (Ferrari, 2012; Ilomäki et al., 2011). It provides a link to the original focus on encoding and decoding processes in the context of computers. As in former times the interaction with digital technology primarily worked via text-based commands, it required memorisation of input patters and, thus, comprehensive knowledge and skills from people. With the advent of the graphic-user interface (GUI) and, more recently, natural-user interface (NUI) computers became increasingly intuitive to use, which underlined und facilitated the shift towards a pervasive integration of digital technologies in everyday lives. Still, this does not mean that, nowadays and in the future, learning how to engage with digital media is not connected to a technical learning process (Ferrari, 2012). Also Hutchison et al. (2012) detects this focus on technical operations in various frameworks of digital competence. However, Ferrari (2012) rightfully observes that it is, most certainly, not restricted to just technical skills, but rather to a variety of different facets. "Digital Competence is at the convergence of multiple fields" (Ferrari, 2012, p. 5) and is strongly connected to other forms of literacy, such as ICT (information and communication technology) literacy, Internet literacy, information literacy, as well as media literacy (Hutchison et al., 2012). Each refers to specific abilities, skills, knowledge and attitudes in the given context. As all these converge into digital competence, each of them has to be considered when talking about the digital competence of an individual.

However, Hutchison et al. (2012) assert that not only the user, but also the tool, or in this case the application has to be factored into the calculation. To illustrate this train of thought, the authors give an example and write that "[r]eading a printed newspaper or an online one is not the same experience and requires different skills, such as, for instance, the ability to move through hyperlinked texts" (Hutchison et al., 2012, p. 79). Although the textual content might be the same, reading in a digital medium certainly requires an altered approach with new premises. It engages the reader in a different way and allows for a new way of interacting with the text, while requiring other levels of competence than with a printed newspaper. Hutchison et al. (2012, p. 89) summarise that digital competence is progressively defined as a framework that follows this insight and "that takes into account higher order thinking skills and that fits in a 21st century skills perspective". Here, computational thinking has to be mentioned as a key component, which will be discussed later in the thesis.

Furthermore, it must be understood that the current concept of digital competence is subject to change, for example because of new hardware developments. "The upsurge of new tools will constantly require a reshaping of users-competences" (Ferrari, 2012, p. 20), with new technologies continuously and regularly changing. For the acquisition of competencies in modern times, it is thus necessary to have an appropriate mindset, which allows for an adaption to new requirements and conventions of advancing technologies (Ferrari, 2012). Additionally, Ferrari (2013) characterises this digital competence as a transversal competence, through which the acquisition of other competencies can take place. Thus, it is obvious that digital competence must be a mandatory part of the education system of the 21st century.

However broad and susceptible to change the definition of digital competence may be, it most certainly encompasses one aspect that is necessary for the integration into teaching, namely learning *with* digital media. Here, Brandhofer et al. (2019) adds the perspective of teaching and learning *about* digital media, which includes basic media education, extensive knowledge about information technology (IT) and conscious reflections about the role of digitalisation for society. In close relation stands the notion of teaching and learning *via* digital media, and *despite* digital media (Brandhofer et al., 2019). Considering the above-

mentioned factors, it becomes obvious that digital education is indeed manifold and therefore requires great efforts in its organisation. Ferrari (2012) extends this train of though and is able to identify three distinctive points for the school related integration of digital competence, which will come up again throughout the following chapters. First, the introduction of learning with digital media influences the contact that students have with learning materials and potentially has a beneficial impact on their motivation and achievement. Second, incorporating digital learning into the classroom acknowledges the prevalence of technology and the necessity to acquire digital competence to be a functional part of society. And third, the closely connected dangers of digital exclusion can be counteracted with the aim of allowing and enabling all individuals to participate in the digital world. As reasonable these elaborations might be, digitally educating is an intricate endeavour, as presented in the following examination of the situation in Austria.

3. Digital Education in Austria

The following chapter gives insight into digital developments and, additionally, focuses on the topic of digital education in connection with Austria's overall educational setting. Over the past few years, a continuous trend towards the digitalisation of everyday lives has been observable. What is most striking in this context is how the omnipresent access to digital media drastically affects younger generations. Keefe-Cooperman (2018, p. 1) very fittingly clarifies this phenomenon by stating that "[t]he children of today are boldly going where no youngster has gone before, as they have never known a life without mobile devices, computers and television". Technology and new media are thus not only permeating the lives of children and teenagers but are actively shaping their later social and professional environment as adults. This is backed by the fact that the age at which children experience their first contact with digital media is gradually getting lower and lower (Mulley & Zuliani, 2013). In relation to Austria this means that almost 100 percent of children possess access to technical devices, and already by the end of primary school about 50 percent even have their own mobile phones (Groißböck, 2019). Keefe-Cooperman (2018) also makes the observation that an increasing number of children learn to navigate the Internet even

before they can read. What is more is the fact that the momentum of digital discourse has not yet come to a halt, but will only pick up pace over time (Brandhofer et al., 2019; Keefe-Cooperman, 2018). Without referring to a specific domain, Kraker (2017) views new developments and innovations as unimaginable without digitalisation. It can therefore be deduced that digital media and their implications already heavily influence people's present lives and will most certainly continue to do so in future years.

This rather recent trend naturally is connected to a multitude of advantages and potential disadvantages that have to be taken into consideration, especially when speculating about the desired future. In that sense, digital media not only bring about advanced and unprecedented opportunities for people, but most importantly demand adjustments of the educational system. Eichmann et al. (2019) highlight the relevance of this topic in a recent report and observe that present educational processes are not yet sufficiently oriented towards the occupational changes of the future.

Although the current curriculum in Austria has already been reworked to conform to these new standards, the actual implementation of new programmes is still in progress. One essential aspect is related to the recently introduced school subject of *"Digitale Grundbildung"* (Federal Ministry Republic of Austria - Education Science and Research, 2018), a term which can be translated as *Basic Digital Education*. Its underlying aim is to educate pupils in the context of digital media and digitalisation throughout their school career. In other words, no teenager should nowadays leave school education without a certain level of digital skills. As these competencies are in the process of becoming standardised nationwide, not only students, but also future employers and parents can rest assured that relevant abilities have been met by the pupil (Nársoy, 2013).

The relevant digital competencies are formulated in the curriculum for the subject of *Basic Digital Education* (Federal Ministry Republic of Austria - Education Science and Research, 2018) and in *digi.komp*, which consists of a series of can-do-statements (Brandhofer et al., 2019). The latter defines a temporal axis that consists of digital skills which students should have mastered at a certain stage of their lives. The first inception of digital education is already set in primary school in the form of *digi.komp4*. Since the schoolyear 2018/19, also

lower secondary education has been delegated to teach students in that matter via the newly introduced course *Basic Digital Education*, relating to *digi.komp8*. However, it has to be noted that due to the novelty of this curricular reform, only first and second forms are being taught with this goal in mind up until now. The subsequent concept of *digi.komp12* refers to the digital competencies which should be acquired by upper secondary students.

In this context of educating students, Dorfinger (2019) emphasises a necessary change of learning procedures when trying to have pupils become digitally competent. Only if teachers and their employment of digital tools are apt, will the learning situation be beneficial (Brandhofer, Kohl, Miglbauer, & Nárosy, 2016). The OECD (2015) adequately states that "[...] adding 21st-century technologies to 20th-century teaching practices will just dilute the effectiveness of teaching". Hence, it is of utmost importance that especially young, but also more experienced teachers meet this challenge and are qualified to teach students practical utilisation of digital media according to their age group. In terms of Austria's school system this demanded change is expressed in the superordinate concept of "Schule 4.0", which will be explained in the following chapter. Due to the possibility of future changes and alterations, it has to be mentioned that the following descriptions represent the state of winter 2019/20.

3.1. Schule 4.0

"There is a requirement that every child should leave the school digitally competent" (Brandhofer, 2014). This quote provides an appropriate insight into digital media as an indispensable component of Austria's educational system in the twenty-first century. However, to meet the current demands for a versatile digital education of children, an augmentation to the curriculum was necessary, which introduced the teaching of digital skills in all primary, as well as secondary schools. The underlying idea of digitally educating pupils has to be understood in the context of *Schule 4.0*, which was derived from the rather economically oriented concept of *Bildung 4.0*. This notion refers to the need for an educational system which is not limited to the central competencies of literacy and

numeracy, but also includes digital skills as a key determinant for future developments (Wahlmüller-Schiller, 2017). *Bildung 4.0* therefore builds upon an interdisciplinary approach of information technology (IT) which ensures that challenges and demands that arise with the progression of digitalisation are met with corresponding know-how. Wahlmüller-Schiller (2017) underlines the importance of this insight, as it will greatly influence people's options and opportunities within the increasingly digital professional environment. Furthermore, "students unable to navigate through a complex digital landscape will no longer be able to participate fully in the economic, social and cultural life around them" (OECD, 2015). Although skills and competencies in the digital context are already of great value nowadays, they will become even more important in future years. A neglect of this responsibility of educating people according to their current and projected needs could thus be seen as short-sighted and can therefore not be tolerated (Micheuz, 2013).

The derived term of *Schule 4.0* was coined by the Austrian Federal Ministry of Education in January 2017 with the intent of transferring the previously described aims to primary and secondary schools. The partial implementation of this programme into primary schools took place in the school year 2017/18 (Himpsl-Gutermann et al., 2018), while the alterations for lower secondary education began in the year 2018/19 and are manifested in the new subject of "Digtitale Grundbildung". The implementation thereof is still in progress (BMBWF, 2018). The prime aim of all these efforts is to provide an opportunity for every student to actively participate in digital applications and, thus, attain substantial digital competencies. Groißböck (2019) underlines schools' leading role in this context by stating that parents generally want to support their children by exposing them to digital media at an early age. Although this thought is indeed reasonable, some parents are not aware of the fact that with full access children might come into contact with inappropriate digital content. Hence the task of supervising and moderating pupils' digital interactions is taken care of by assigning it to the school.

However, to allow for students to actively engage with digital media, several governing aspects have to be considered. It is not enough to only provide students with opportunities to use digital media in class, but rather the whole scope of involved factors has to be

considered. In that way, all public primary and secondary schools in Austria must supply the essential technological infrastructure, as well as provide teachers that know how to effectively utilise digital materials.

Hence, *Schule 4.0* is constituted around four interdependent pillars, which are defined as follows (Barberi, Swertz, & Zuliani, 2018; Bundesministerium für Bildung, 2017a; Bundesministerium für Bildung, 2017b)

First pillar: Digitale Grundbildung (*Basic Digital Education*)
Second pillar: Digitally competent teachers
Third pillar: Infrastructure and IT-equipment
Fourth pillar: Digital learning tools

These four pillars will be described in more detail in the following subchapters.

3.1.1. Digitale Grundbildung (Basic Digital Education)

First, *Digitale Grundbildung* (Basic Digital Education) is a school subject which initiates and fosters student participation in different aspects of digital media and gives an insight into the role of digital technologies for society. It therefore represents the quintessence of Schule 4.0 (Barberi et al., 2018). This idea of a standardised digital education has been discussed for some time, but only recently has seen its practical realisation in the Austrian curriculum (Barberi et al., 2018; Brandhofer et al., 2019; Federal Ministry Republic of Austria - Education Science and Research, n.d.a).

This form of educating the students in the context of new media finds its starting point in primary education (Barberi et al., 2018), mainly focusing on the last two years thereof (Bundesministerium für Bildung, 2017b). In this context, a pilot study called *Denken lernen, Probleme lösen (DLPL)* was conducted in the years 2017 and 2018 in order to extensively investigate the ministry's plan of establishing and testing *Schule 4.0* in actual primary school situations (Himpsl-Gutermann et al., 2018). One hundred different primary schools in all federal provinces of Austria received technical equipment that helped establish digital media as a valuable part of teaching and thereby promoting the students'

computational thinking in a playful way. As implied by its name, computational thinking is closely related to processes of computers and describes an analytical way of problem solving (Shute, Sun, & Asbell-Clarke, 2017). This concept will be discussed more extensively in the following chapters. DLPL focused on three areas, namely logical thinking, basic coding and robotics (Himpsl-Gutermann et al., 2018). The final project report shows clearly that the project was indeed a success and throughout the tested classes, skills concerning problem solving improved with the provided materials. The specifically created community platform played an important role in this matter, as teachers could use their access to adapt the content and materials to the given circumstance of student level or proficiency. However, the report also revealed possible obstacles which were mainly related to problems with the wireless Internet connection or other technical equipment (Himpsl-Gutermann et al., 2018). The results supported the approach of *DLPL* employed and it was thus decided that basic levels of digital education should continue to exist in primary schools, in order to pave the way for further programmes. What is interesting in this context is the widespread decision to employ a subject integrated approach when teaching digital skills (Brandhofer et al., 2019). This could be considered a sophisticated choice, because it most definitely mirrors an age appropriate approach to the topic.

After primary school, students continue their digital training in lower secondary education and build upon their acquired knowledge to further extend their digital competencies. In order to help them attain this goal, the compulsory course *Basic Digital Education* (Digitale Grundbildung), with its specific curriculum has been introduced starting from fifth grade and continuing to eighth grade. The total extent is scheduled to consist of 64 to 128 teaching units, which roughly translates to two to four weekly lessons (BMBWF, 2018). However, the actual scope depends on the chosen form of implementation in a specific school (BMBWF, 2018; Bundesministerium für Bildung, 2017b). Here, it is noteworthy that schools can act autonomously in their decision to employ a subject-isolated or subject-integrated approach of this concept. The former describes a dedicated, but mandatory course that pupils must attend, in which the relevant skills are taught extensively. The latter refers to the decision of allocating *Basic Digital Education* to all other school subjects, while assigning different competence areas to certain fields. The school choice of the

school therefore greatly influences the structure and quantity of realisation. Although overall organisation my differ, the teaching content is explicitly defined. The curriculum consists of three overreaching goals, formulated as competencies, namely digital competence, media competence and political competence. These areas are further organised into a total of eight different sub-goals which ought to be acquired by the students during this course (Federal Ministry Republic of Austria - Education Science and Research, 2018):

1. Social aspects of media development and digitalisation
2. Information, Data and Media Competence
3. Operating Systems and Standard Applications
4. Media Design
5. Digital Communication and Social Media
6. Security
7. Technical Problem Solving
8. Computational Thinking

These eight categories are intertwined with the general curriculum of lower secondary education and each consists of two to four sub-segments, which include competencies with corresponding descriptors. The following example of the sub-segment *Text Processing* as part of the competence *Technical Problem Solving* gives insight into this structure (Federal Ministry Republic of Austria - Education Science and Research, 2018):

> Schülerinnen und Schüler
> – geben Texte zügig ein,
> – strukturieren und formatieren Texte unter Einbeziehung von Bildern, Grafiken und anderen Objekten,
> – führen Textkorrekturen durch (ggf. unter Zuhilfenahme von Überarbeitungsfunktionen, Rechtschreibprüfung oder Wörterbuch).

It translates to students' ability to enter a text swiftly, to structure and reformat documents also via the use of images and objects, as well as to correct texts with digital dictionaries or the spell check. It can be observed that the eight competence areas, their sub-segments and the corresponding descriptors are clearly developed (Brandhofer et al., 2019). Since the focus of empirical study of this thesis is oriented on pupils of lower secondary education a closer look at the aforementioned competencies will be taken in

chapter 3.3.. The present exemplification primarily helps to comprehend what students should be capable of in order to fulfil the requirements of the described sub-category and, ultimately, the related competence.

Digital education in upper secondary education is realised via the model of *digi.komp12* which mainly consists of an extensive focus on further IT skills. There are four core areas that students should master before arriving at Matura-level, which represents the final leaving exam in Austria. All competencies are covered by descriptors in the form of can-do statements. To illustrate this, an example is taken out of the category "*Informatiksysteme: Betriebssysteme und Software*" (information technology systems: operating systems and software): *"Ich kann Software zur Bewältigung von Aufgaben bewerten und die Wahl begründen"* (I can evaluate software according to tasks and justify my choice) (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020d). Skills range from knowledge about the relevance of technology for society and future professions, to practically oriented operations with database systems (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020d).

Furthermore, students always have the opportunity to test their competence level according to their current advancement on a separate online platform called *digi.check*. This programme is commissioned by the Federal Ministry for Education, Science and Research and aims at not only allowing students to get feedback about their skill level, but enabling teachers to get an overview of their pupils' progress. Results are useful as they point out possible shortcomings and needs for further consolidation. The website and the corresponding tests are built upon the previously discussed competence model of *digi.komp* (Bundes- und Koordinationszentrum eEducation Austria, 2016). As the testing process mirrors the respective *digi.komp* competencies and age levels of the students, it allows for three test stages, namely *digi.check4, digi.check8* and *digi.check12*. The structure of these check-ups differs slightly with progression of expertise, however *digi.check4* is considerably different to the subsequent tests. It employs an approach that is more suitable for younger children by using stickers. These can be received after the successful mastery of certain digital tasks and can afterwards be collected in the student's individual booklet. The stickers are meant to function as a motivator and thus help the

young children to complete all the necessary tasks by the end of primary education. After completion, the booklet then is officially signed by the school administration and remains in the pupil's possession (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020b). *digi.check8* and *digi.check12* on the contrary utilise a self-assessment scale which is subsequently compared to automatically calculated results of a second stage consisting of competence relevant tasks. These range from theoretical questions to more practically oriented, "in-application" tasks (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020c). In the end, students will be presented with a juxtaposition of their self-assessed competence levels and their actual achievement, which has been derived from their performance in the second stage.

3.1.2. Digitally Competent Teachers

The second pillar of *Schule 4.0* is concerned with the need for digitally competent teachers. Although a lot of effort went into designing digital education for pupils, Brandhofer et al. (2016) are of the opinion that shortcomings in one crucial aspect, namely the digital education of the educators, are noticeable. Andrei (2017) underlines personal motivation and attitudes, as well as teachers' contentment with using technology as determining factors of their willingness to integrate digital learning tools. It is most definitely not desirable that teachers who almost always are perceived as role models lack digital skills (Brandhofer et al., 2019). A plausible explanation could be related to the fact that teachers might "lack a personal reference point to look back on when teaching" (Keefe-Cooperman, 2018, p. 1), as many have not experienced digital media in their own time as students. Even those that had the advantage of working with emerging new technology, will never be as versatile as children of today, which are fittingly referred to as *"Digital Natives"* (Keefe-Cooperman, 2018, p. 1). Bakla (2019) puts forward the idea of comparing digital technology to a language, with children born after the 1980s as its native speakers. The author goes on to define the difference by stating, "those born before that so-called cut-off point would retain their "accent" no matter how proficient they are in using technology" (Bakla, 2019, p. 15). Likewise, relying on future generations of teachers which

might already be part of digitally natives cannot be the answer (Honegger, 2017). Thus, it becomes obvious why the European Institute for Gender Equality (2018) stresses that the relevant skills of educators are vital for a successful and appropriate digital education of children and teenagers.

Thus, to counter this unfavourable tendency of teachers not meeting the digital requirements, which is not only evident in Austria, but also internationally observable, a new foundation in the form of *digi.kompP* has been introduced by the former Federal Ministry for Education and Women. It completes and rounds off the previously described competence models of *digi.komp4*, *digi.komp8* and *digi.komp12* which Austrian students have to achieve during their Primary and Secondary Education (Brandhofer et al., 2016; Federal Ministry Republic of Austria - Education Science and Research, n.d.b). The main difference here is that it is not the students, but the teachers who have to actively engage in fostering their digital competencies. In its developmental phase, the objective of this programme is to have all its components compatible to the previously described stages for students and to design an easily intelligible structure which is evident in the following diagram.

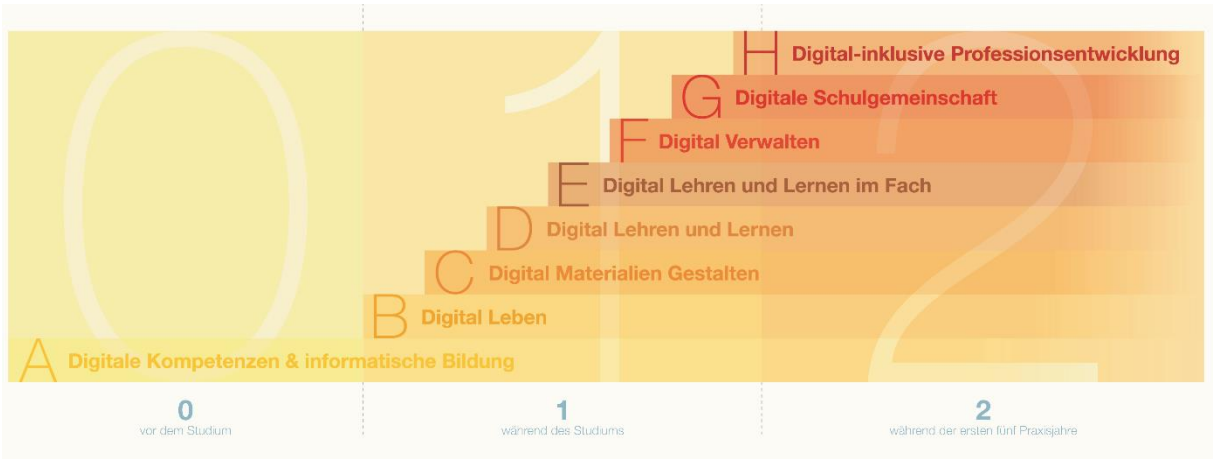


Figure 1: digi.kompP

The concept of *digi.kompP* consists of three encompassing stages of development (0,1,2) and eight categories (A-H). Stage 0 describes the time before university and relates to the competencies that should have been acquired in school via *digi.komp12.* In other words, it refers to those skills, which are at the level of Austria's final certificate of secondary

education, the Matura. The transition between stage 0 and stage 1 is marked by the initial enrolment at university. Phase 1, subsequently, refers to digital competencies that should be acquired during teacher-education at university. Ultimately this results in a final transition to phase 2, which is accompanied by the completion of studies. Lastly, Stage 2 describes those competencies which are part of daily and continuous teaching and are gained via further education programmes (Brandhofer et al., 2016).

The eight underlying categories are each defined individually but are at the same time part of the previously described stages. Essentially, category A *Digital Competencies and Teaching of IT* is divided into descriptions for A0, A1, and A2. Crucial in this context is to understand that each category has no distinct endpoint, but only a different starting point. Thus, not all categories are part of stage 0, as they might only be relevant after a certain progression in the university studies. Moreover, if a teacher has fulfilled the necessary requirements for category A0, A1 and A2, this does not directly mean that they can stop working on the contained competencies. Rather, a constant practice of the acquired skills is mandatory, in order for teachers to stay up to par. From a wider angle, it becomes obvious that if a category stretches over stage 1 and 2, the former mainly focuses on the acquisition and mapping of skills and abilities, while the latter typically comprises a rather practical application.

As mentioned before, category A corresponds to the standard of *digi.komp12* and bears the name *Digital Competencies and Teaching of IT* ("Digitale Kompetenzen und informatische Bildung). It includes theoretical and practical abilities in the areas of IT systems and an overview of their significance for society. Living, learning and teaching in the scope of digitalisation and also investigating ethical questions, such as accessibility, constitute category B *The Digital Life*. Interdependencies between technological advancements and society should be analysed, in order to facilitate a lasting education.

The next category is of paramount importance for this thesis, as it encompasses the selection and evaluation of a particular online learning platform, namely *MORE! Cyber Homework*. Category C, *Designing Digital Material,* is concerned with the process of searching, assessing, selecting and evaluating online materials or online platforms. Via

testing out existing possibilities, teachers automatically adapting the available materials and planning out how to incorporate these into their teaching. Legal aspects and data protection play an important role in this context and should always be considered. *Digital Teaching and Learning* is the title of category D, which is structured mainly around the evaluation via formative or summative feedback, but also the integration of digital learning processes into their classes. For that purpose, teachers are obliged employ different systems for the best outcomes in their students. This can for example mean the regular use of divers learning platforms, e-portfolios or apps, which should all be fully mastered by the teacher. As Category E resembles a further extension to the previous category, it hence bears the title *Subject-Specific Digital Teaching and Learning*. It displays many similarities but extends the mandatory skills by stating that teachers should be able to deduce and subsequently know what forms of digital learning suit a certain subject better. Category F, *Digital Administration*, relates to the general know-how concerning organisational matters, such as the responsible control of student lists or proficiency when working with the digital attendance register. This area, furthermore, not only incorporates the administration of school processes, but it should also reach to personal bureaucratic issues. The communication and collaboration in school is the focal point of category G *Digital School Community*. This relates to both, an internal, as well as an external information exchange, which naturally must follow the netiquette rules. The final category H *Digital Career Development* is concerned with advancements in further education and a professionally adequate utilisation of digital media. Relevant competencies consist of capabilities in researching existing scientific data, as well as participating in scientific studies. Furthermore, teachers should be competent in knowing how to present themselves in social media platforms and have comprehensive knowledge about the relevant tools for testing student knowledge (Brandhofer et al., 2016).

Having defined the three stages and the eight corresponding categories, it becomes obvious that keeping track of all these competencies that teachers should acquire and practice during their careers is rather demanding. Hence, the previously discussed competence test called *digi.check* is also available for teachers. In that way, they can verify what skills they already have acquired and in what sectors they need further qualification

(Kraker, 2017). Although this might relieve the enormity of the task a bit, the challenge of educating future and existing teachers is still colossal. For this reason, higher educational institutions are increasingly endorsing the task of training the teachers accordingly. In this context, the teacher training college of Lower Austria is to be mentioned, which aims at further improving and optimising this process under the name of *Further Education 4.0* ("Weiterbildung 4.0") (Kraker, 2017). Since 2019, also the University of Vienna offers a curriculum called "*Digitalisierung verstehen und Mitgestalten*" which focuses on an interdisciplinary analysis of digital media and their implications for and effects on society. Groißböck (2019) points out a positive development, as an increasing number of primary school teachers are taking part in further education programmes concerning digital media. Still, it is the objective that not only new, but also already experienced teachers use these opportunities to keep their digital competencies up to par (Bundesministerium für Bildung, 2017b).

3.1.3. Infrastructure and IT-Equipment

The trajectory of students towards digital competece is directly linked to the systems available in their school context. Hence it can be deduced that the necessity "to integrate technological tools into the instructional setting in order to deploy their potential" (Dalton-Puffer, Boeckmann, & Hinger, 2019, p. 221) is of paramount importance. Nársoy (2013), Brandhofer et al. (2019) and Dorfinger (2019) are of a similar opinion. Micheuz (2013) nominates the computer as the fundamental factor for hands-on student involvement. Without opportunities to practice their digital skills and expertise, students will most certainly never fully achieve the desired competence levels. However, it is not only computers that are needed to enable students to actively engage with digital media, but also peripheral devices, such, and a stable Internet connection, as well as sufficient Wi-Fi coverage. It is exactly this circumstance that currently still represents a problem for schools. Although the plan to digitally educate all pupils throughout their educational career has already been implemented, not all schools are providing the required equipment (Bundesministerium für Bildung, 2017b). The final project report of the

previously quoted *DLPL* programme underlines the existence of hardships concerning the availability of relevant infrastructure and facilities in primary education (Himpsl-Gutermann et al., 2018). It has to be noted that these results were established about one year after the Federal Ministry forged plans on implementing their *Breitbandinitiative* that should have had countered this predicament already in the year 2017 (Bundesministerium für Bildung, 2017a; Bundesministerium für Bildung, 2017b). Their sought after goal is to, each year, equip all 86000 students of fifth grade with tablets and all 84000 students of ninth grade with laptops (Bundesministerium für Bildung, 2017b). Here, it has to be noted that more recent information is not available to verify the status of progression during the schoolyear 2019/20 in which this thesis is written. Still, it clearly continues to represent a problematic area, as could be observed in the distance learning phase during the Covid-19 pandemic in early 2020.

To reiterate, the three main aspects that the third pillar of *Schule 4.0* focuses on are the improvement of broadband Internet, Wi-Fi and the availability of tablets and notebooks at schools (Bundesministerium für Bildung, 2017a). These factors function as the basis for the realisation of an enhanced digital approach in primary, as well as secondary education.

3.1.4. Digital Learning tools

The fourth pillar of *Schule 4.0* focuses on the benefits of studying with modern digital materials. First and foremost, a noticeable decrease in necessary administrational efforts can be observable when existing materials and tools are used (Brandhofer et al., 2019). Furthermore, the range of tasks and task types, in combination with their adaptability proves to be advantageous for various teaching contexts. In other words, "[...] technology allows teachers and students to access specialised materials well beyond textbooks, in multiple formats, with little time and space constraints" (OECD, 2015, p. 4). However, the quality of these tools and tasks represents a vital factor in their usefulness and is directly linked to a possible employment in actual teaching situations. Poorly designed educational software could negatively impact the utility of digital media usage in the classroom (OECD, 2015). The suitable quote "[t]echnology can amplify great teaching but great technology

cannot replace poor teaching" (OECD, 2015) gives a synopsis of interrelation between the teacher and the choice of materials.

For this reason, teachers need well-functioning and free access to reviewed digital materials for teaching and learning. As a consequence of this demand, the Federal Ministry for Education has commissioned the online platform *Eduthek* (eduthek.at) (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020a). This website has been made publicly available in March 2020 during to the call for online teaching resources in the Covid-19 pandemic. The plan was that it should offer a multitude of open-source digital content and materials (Barberi et al., 2018). This goal has been achieved, while it also has to be mentioned that the website consistently sees the addition on new content. Pupils, parents and teachers have to firstly specify the learner level (elementary, primary, lower secondary, upper secondary) and subsequently choose from the available subject categories. For primary education and higher, this includes the three subjects German, English and Mathematics, which are again segmented into divisions according to grades (Bundesministerium für Bildung, Wissenschaft und Forschung, 2020a).

Furthermore, this webpage recommends pedagogically relevant applications and games, as well as inspiring new forms of teaching with innovative tools (Bundesministerium für Bildung, 2017b). In this framework, the concept of gamification has to be mentioned, which plays an important part in engaging pupils with digital media tasks. Gamification describes a transfer of characteristics that are evident in games to game unrelated contexts. Although the degree of its employment might vary in correspondence with the age of the students, gamification can boost motivation in complex and monotonous tasks (Abrams & Walsh, 2014; Brandhofer et al., 2019).

Another area for improvement concerning digital learning tools is the utilisation of eBooks in the classroom and at home. This form of media allows for all forms of interaction that are possible with the analogue equivalent, such as highlighting, annotating and bookmarking. The advantage lies in the additional interactive task design, which would not normally be realisable. Students can benefit from text and image enlargement, three dimensional renderings and text-to-speech output. Likewise, eBooks can also incorporate

server-driven tasks which can be automatically assigned, as well as evaluated (Brandhofer et al., 2019). Hence, it should be possible for students to further deepen their knowledge about any given topic via these additional ways of interaction (Bundesministerium für Bildung, 2017a). These benefits come into effect especially, if distance learning is required or after a longer absence of pupils, when they are required to catch up with the course materials on their own.

3.2. New Requirements for Schoolbooks

It has been demonstrated that the undertaking of digital education on a nationwide level is in itself a complex endeavour. At the same time, high expectations are placed one the diversified school system to cover several competence areas on different levels for all pupils in Austria. Additionally, several governing factors influence whether digital learning processes could be realisable and how effective they can turn out for the individual student. A crucial insight in this matter is connected to the significance of the students' contact to digital media. Without opportunities to engage with digital materials and applications, the requirements of the curriculum simply cannot be realised. However true this may be, the OECD points to another level of this observation by asserting that the sole availability and use of digital media is no guarantee for the desired outcome. Just by working with technology, it is not feasible to have students become digitally competent (OECD, 2015). Rather, digital media have to be purposely tailored according to the needs of students in respective age group and competence level. Although some central hubs for digital materials and tasks have already been created and are in the process of expansion, it is still in the remit of teachers to analyse and evaluate what is available. To facilitate this condition, nationwide publishers have already started to support teachers by providing a collection of relevant materials that supplement the respective coursebooks. In other words, it is ensured that the contents of the coursebook are kept up-to-date with the curricular standards of having students develop digital competencies. As these developments, both in the curriculum and in adjustments in task design are rather recent, further changes might occur in the near future. New developments with respect to digital learning tools can be especially advantageous in the context of language learning, as they

open new means of interacting with the language. Therefore, it is of great value for English teachers, and others, to familiarise themselves with the current status quo. Only if deliberate employment of digital media tools is guaranteed, can they yield remarkable results (Brandhofer et al., 2016).

The following sections try to answer the first research question and thereby establish a valuable background for the following empirical study which builds upon this knowledge.

Research question 1: "In how far does the *MORE! Cyber Homework* platform fulfil the demands of the Austrian curriculum for different competencies related to *Basic Digital Education (Digitale Grundbildung)*?"

3.3. The digital component of MORE!

In the following it will be investigated how one of Austria's most commonly used schoolbooks, i.e. *MORE!* (Gerngroß et al., 2016), positions itself in relation to these rather recent developments towards digitalisation. The *MORE!* school book series is designed for lower secondary education and therefore is linked to the *digi.komp8*-concept and the new subject of *Basic Digital Education.* Hence it was a concern to accommodate the recent orientation in the structure of the books. This is evident in the publisher's website which has a specific category for "*Digitale Grundbildung*" (Helbling Verlag, 2020a). Not only do the publishers claim that *MORE!* is suitable for the teaching of digital skills but they also present it as covering most of the relevant competence areas. For that purpose, *Helbling* supplies outlines for a practical realisation with two, three or four lessons per week (Helbling Verlag, 2020a). It can therefore be easily adapted to the selected realisation of *Basic Digital Education* in the specific school with up to four weekly study periods. The stage-specific chart illustrates what digital competencies of the curriculum are covered by certain tasks (Helbling Verlag, n.d.). While the books for all four years of lower secondary education appear in the chart, not all competence descriptors have tasks ascribed to them. Still, it definitely gives teachers a valuable overview of what the different *MORE!* schoolbooks include for each year. Especially in regard to the choice of a school for a

subject implemented approach to the teaching of *Basic Digital Education,* this could prove to be valuable.

3.3.1. MORE! Cyber Homework

Another crucial element of educating the pupils digitally has so far not explicitly been mentioned, although it most certainly belongs in this context. In addition to the categorisation of tasks in the *Student's Book* and *Workbook* according to their digital competencies, the publishing house *Helbling* also has implemented a digital platform under the name "*e-zone* – die Lernplattform" (*e-zone* – the learning platform) (Helbling Verlag, 2020b). To fully understand the following deliberations, relevant aspects of the online learning platform have to be described first. The *e-zone* functions as the central hub for navigation, with the *Cyber Homework* as its most essential constituent. They represent a supplement to the units of the coursebooks and mirrors the contents that are taught in the lessons. Students gain access via a personal account, and so the pupils themselves, as well as their teachers have the opportunity to monitor their progress. The central component of the *e-zone* platform is connected to the idea of online homework, which is referred to as *Cyber Homework* (Helbling Verlag, 2020c). Each part of the homework corresponds to the structures that were introduced in the unit and consists of systemically grouped tasks which, in total, take about ten to twenty minutes to finish (Helbling Verlag, 2020c). The employed exercises differ in every instance, with exercises consisting of vocabulary, reading, grammar and listening. The last thereof is additionally emphasised, as the digital medium allows for individual listening practice, which would normally not be easily realisable. For each *Cyber Homework*, teachers have the opportunity to define what and how many tasks they want to assign and to set a specific time frame. Furthermore, they can allow for repeated attempts by the students or choose to deactivate this feature entirely. Students on the other hand, can individually decide which task they want to tackle first and receive an immediate automatic evaluation of what percentage they achieved after having finished an exercise. If multiple attempts are available, students can redo the respective exercises and work on improving their results. When an exercise is repeated,

however, the constituents of the tasks vary in their order, to partly prevent students form remembering the sequence of correct solutions. Via this method it is possible to counteracts students' attempts to "game the system" (Lunsford & Pendergrass, 2016, p. 537), i.e. an expression to pupils' guessing of correct answers in a trial-and-error approach, which undermines the learning process. For this reason, the platform not only keeps track of what has already been done, but also of how many attempts were used. The information about the progress is not only provided to students in the form of their individual results, but also to teachers in the form of an overview of the entire class. This class overview can additionally be utilised to investigate which tasks prove to be difficult or easy for individual pupils. For that purpose, teachers can access a considerable amount of information about the input of specific students and the number of their attempts and compare these to the rest of the class. Indeed, this could in some cases present an overload of information and be rather overwhelming. Nonetheless, it is still beneficial that the *e-zone* allows for this kind of tracking, even if teachers chose not to utilise this feature on a regular basis. When needed, relevant information can be access and, thus, it is possible to better comprehend strengths and shortcomings of individual students and identify problematic tasks.

3.3.2. MORE! Cyber Homework in the Context of the Curriculum

The *e-zone* platform and the corresponding *Cyber Homework* of *MORE!* are not directly labelled as supplementing digital education of students, yet they most definitely fulfil the widely postulated contact with digital media (Brandhofer et al., 2019; Dalton-Puffer et al., 2019; Dorfinger, 2019; Nársoy, 2013). Since it has hitherto not been clearly expressed how *Cyber Homework* could prove its usefulness in the context of the demands of the Austrian curriculum, the present thesis focuses on this aspect. For that reason, relevant competencies of the previously discussed curriculum for *Basic Digital Education*, which is closely related to the concept of *digi.komp8,* will be scrutinised according to the available task types of the online platform.

What immediately becomes clear is that the requirement of contact with digital media is voiced in the curriculum. In the section of general teaching responsibilities, it is explicitly stated that imparting skills for media utilisation is a key component of digital education: "Medienkompetenz ist eine Schlüsselkompetenz. […] Die Vermittlung von Medienkompetenz umfasst die Fähigkeit, Medien zu nutzen, […]" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 3). This competency, not exclusively, but still most essentially, consists of the students' active engagement with digital tools. *MORE! Cyber Homework* hence could be identified as one possible realisation of this necessity, mainly by allowing pupils to use and work with the learning platform. Although it only represents one specified form of what is available on the Internet, the fact that the platform stands in close connection to the schoolbook is a certainly valuable asset. In other words, the online exercises are an extension of already familiar tasks that are dealt with at school. That way, the students' focus is not primarily set on the digital task and the connected acquisition of digital competencies, but rather on the execution of the academic tasks that are posed on the e-learning platform. Hence it can be deduced that the online interaction with the platform serves as a means to the desired end of an improved language acquisition. The quote "Schülerinnen und Schüler […] nutzen diese [digitale Medien] meist unbefangen und vielseitig […]" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 3) expands the previous train of thought with a rather optimistic statement about the students' unconstrained and simultaneously versatile use of digital media.

Concerning the diverse application of digital media just mentioned, it is true that *MORE! Cyber Homework* is, indeed, limited to the training of the English language, but it does so in a multifaceted way. Countless types of reading-, listening-, vocabulary- and grammar-tasks are provided in various forms, both in structure, as well as in design. The *Cyber Homework* can thus be described as an assistance for teachers in the matter of familiarising students with digitally processable task, but it also has to be grasped that the realised contact between students and the online platform heavily depends on the teacher. This essentially includes the fact that some resources of working with the *e-zone* might have to be surrendered to technical problems and questions, in order for things to continue

smoothly for all pupils. Especially in earlier forms of secondary education it might be inappropriate to presume that all students are familiar with the basics that are needed to cope well with the learning platform. Here, it is the duty of the teacher to positively influence the students' overall disposition concerning these obstacles. Digital media should not be regarded as a handicap, but rather as providing new opportunities for various contexts.

The knowledge required for the practical handling of the computer represents the following aspect of the curriculum, which is covered by *Cyber Homework*. It corresponds to the skills pupils need in order to engage with the learning platform *e-zone* in the first place. The idea is part of the competence cluster *Operating Systems and Standard Applications* and is described as "Schülerinnen und Schüler nutzen die zum Normalbetrieb notwendigen Funktionen eines Betriebssystems […]" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 5). The curriculum defines the basic ability to effectively use an operating system for a specified purpose essential in the digital scope. Without this set of skills, it would not only be impossible to utilise what the *e-zone* has to offer, but all other digital undertakings would also be fruitless. In order to succeed with the tasks of the *Cyber Homework*, students have to be capable of starting the operating system, either on a computer or mobile device, open a browser, navigate to the *Helbling e-zone* platform, sign in with their credentials, orient themselves with the assignments and carry out the tasks. For all these actions they will typically use mouse and keyboard input. This is in line with the curricular demand for digitally able students to be capable of entering text swiftly, presumably with the just mentioned peripherals, which includes the use of mouse and keyboard, but also headphones, speakers and cameras. This descriptor is also part of *Operating Systems and Standard Applications* and is formulated rather concisely: "Schülerinnen und Schüler geben Texte zügig ein" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 5). By any means, this description is not restricted to the English language and to words, phrases and sentences that have to be entered on the learning platform in question. Still these practices can be seen as valuable training for other applications, for example in German, with much longer texts. Furthermore, the term *swiftly* ("zügig") is open for interpretation, especially in connection

with students of different age groups. Students of fist form in lower secondary education will definitely not manage to enter text at the same rate as students that are two to three years older. Hence, it is important to adjust this assessment to the respective age group.

The most important insight about what competencies are covered by *MORE! Cyber Homework*, however, is connected to the section of *Computational Thinking*. Generally speaking, this competence cluster relates to knowledge about how computers handle given tasks and execute corresponding solutions. However, computational thinking is not restricted to theoretical knowledge about calculations carried out by a computer, but it includes people's practical skills in approaching online and offline tasks in a structured and efficient way. Efficiency, here, is of twofold importance, as it not only describes the competent engagement with the task at hand, but also the possible transfer of gained insights about the approach to a following assignment. Shute et al. (2017) define computational thinking as "the conceptual foundation required to solve problems effectively and efficiently (i.e., algorithmically, with or without the assistance of computers) with solutions that are reusable in different contexts". It becomes clear that the notion of computational thinking is closely related to a systemic approach to given problems, with emphasis on the identification of structural similarities and a thereby emerging improved problem-solving process.

MORE! Cyber Homework covers two aspects of the above-mentioned competence cluster that is outlined in the Austrian curriculum. The descriptor "Schülerinnen und Schüler vollziehen eindeutige Handlungsanleitungen (Algorithmen) nach und führen diese aus" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 7) concerns the students' abilities to grasp what is demanded of them in a given task and its subsequent resolution. In the case of an exercise of the *Cyber Homework*, this means that students first have to comprehend what the requested actions are before settling for the next step.

This is, indeed, inherent to almost every other task that has to be carried out by pupils in their school career, but the online platform does most certainly differ in task design. Just one exemplification for this factor can be found in so called drag-and-drop exercises, in

which students must correctly match phrases or words with corresponding items. The computational skill in this context is to understand the different stages of actions that are necessary for a drag-and-drop exercise and how to execute these via the use of mouse, keyboard or even touch input. For that reason, the curriculum mentions *algorithm* in this context, which encompasses a stepwise approach to problem solving. In the present case, this would include a grasp of the prompt and all the necessary steps in achieving the desired goal by clicking, dragging and dropping in the correct moment and place, thereby matching appropriate items. The acquired competence related to the employed technique can then be translated to suit other tasks, which might not even have anything to do with language learning. Again, the set of skills that have been gained in the area of computational thinking can also be adapted to non-digital environments.

It is exactly this aspect that the next descriptor of computational thinking refers to with the statement "Schülerinnen und Schüler entdecken Gemeinsamkeiten und Regeln (Muster) in Handlungsanleitungen" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 8). The focus lies on the desired students' realisation that some components of task design are to a certain extent similar or can at least be compared to each other. That way, it is possible to decrease the time required for initial apprehension and, thus, increase overall efficiency. The characterisation "Schülerinnen und Schüler können intuitiv nutzbare Benutzeroberflächen und dahinterstehende technische Abläufe einschätzen" (Federal Ministry Republic of Austria - Education Science and Research, 2018, p. 10) further specifies the notion of similarities between different task designs and emphasises knowledge about technological processes that take place in the background. In connection to *MORE! Cyber Homework* this, most prominently, amounts to the pupils' realisation that the computer only registers formally correct input in open questions or phrase exercises. In other words, they have to learn how to write a full English sentence on the keyboard with all the corresponding rules and symbols of the English language. Thus, pupils have to manage the use of the shift key in order to capitalise the first letter and possibly some upcoming names. They must also be familiar with the grammatical use of punctuation marks and their respective keystroke combinations on the keyboard. This is especially relevant for inverted commas, as there are several symbols which look similar,

but are not interpreted as correct by the system. Finally, it is also a question of appropriate spacing between words or symbols and the necessity of a full stop or other special characters at the end of a sentence. All of these gained insights can then be transferred to other eventualities, in which text has to be entered into the computer, be it in English or even another language. Moreover, students must be capable of differentiating between the platform-integrated and the web browser's own navigational buttons. Although the buttons in question might seem resembling, there is a difference between closing an exercise and closing the whole page, which completely logs one out of the *e-zone*. Both outcomes are visualised with an "X", yet one operates within the learning platform, whereas the other is related to basic actions of the operating system. When working with the *e-zone*, the goal is to manoeuvre between the self-contained pages and not having to start again from scratch each time, a task is finished. Again, knowledge acquired via this practice can then be transferred to contexts of other platforms, which might not even be related to learning or practising a language.

To formulate an answer to the first research question, several competencies of the curriculum for *Basic Digital Education* are, indeed, covered by *MORE! Cyber Homework.* Some of these can be found in the structure of the learning platform, while others might only scratch the surface of the postulated digital abilities that students should acquire during lower secondary education. Although the *e-zone* is a means of achieving a number of the newly postulated digital competencies by the curriculum, it most certainly does not and cannot cover all of them. In this context, it must be mentioned that the *e-zone* platform appears to be predominantly suitable for a subject-integrated approach to teaching *Basic Digital Education*. Otherwise, the English language could form an additional barrier that hinders students in gaining the necessary abilities in the short time frame of a subject-isolated approach. Egger (2018) relates this insight to the concepts of support ("Unterstützung") and competition ("Konkurrenz"), which he derived from observations of *Basic Digital Education* in connection with the teaching of Mathematics. The former denotes additional value via new didactic possibilities in the respective subject, which would normally not be realisable. The latter mainly relates to an excessive effort of attention to the digital aspects, instead of the desired subject-specific content. Hence it

can be deducted that More Cyber Homework should, in fact, be employed in a subject integrated approach. That way it is possible to render the *e-zone* as a worthwhile online learning platform that supports new developments towards digital education for lower secondary students.

4. Online Homework

Building on the insights gained from the discussion of *MORE! Cyber Homework* as a valuable implementation for some of the Austrian curriculum's digital competencies, the thesis now repositions the focus onto a superordinate level. Although the *e-zone* by *Helbling* embodies a well-functioning online homework platform, the idea of such a system is neither one of a kind nor new (Aroroa, Rho, & Masson, 2013). An observation made by Doorn, Janssen and O'Brien (2010) allows for a better comprehension of the significance of online homework: "Over the past two decades there has been increasing movement toward the use of computers and the internet in conjunction with many courses across the educational spectrum." (Doorn et al., 2010, p. 1). Similar findings are brought forward by Altun (2008), Perdian (2013), Rhodes and Sarbaum (2015, p. 120) and the OECD (2018). Hence, this development poses the question of the underlying sentiment behind teaching with a digital homework system. The following chapters will investigate the positive, as well as the potentially negative implications of the shift from traditional pen-and-paper homework to the modern system of utilising the Internet for this element of teaching.

4.1. Theoretical background

As an initial step in understanding the rationale behind the transition to online homework, this aspect of teaching has to be defined first. As generally known, the process of teaching students takes place with them sitting in the classroom and with at least one teacher present. Still, the learning process of students is, by all means, not limited to their physical presence in school. Richards (2015, p. 5) emphasises, "[t]here are two important dimensions to successful second language learning: what goes on inside the classroom and

what goes on outside the classroom". Especially in the case of many work intensive subjects, such as foreign languages, it is not enough to position the learning procedure of the students solely in the face-to-face sessions. This would neither be effective nor feasible for an optimal outcome in the acquisition of knowledge and skills.

Bowman et al. (2014, p. 47) underline this notion by stating that "[s]tudying outside of class is essential to success" and the OECD (2018) have been articulating a similar position. The obvious consequence is to have the students continue to learn the contents of the respective subject by performing various tasks when they are not present in school. Therefore, the time that is dedicated to the learning process is extended for learners by working on tasks and exercises at home. Clearly, this might not be entirely welcomed by pupils, but without doubt homework enhances overall learning (Perdian, 2013). Thus, the widely known reputation of homework resembling "a necessary extension of the classroom" (Dodson, 2014, p. 354) gains support. Particularly upper-elementary and secondary pupils' achievement is influenced by the amount of homework they are given (Albelbisi & Yusop, 2018). A predominant advantage is that out-of-class exercises which build upon the previous learning activities are useful with respect to enhancing the students' comprehension of the content covered in the course (Doorn et al., 2010). Furthermore, "[t]hey assist students to understand what is learnt at school better and improve their retention levels and help them to improve their study skills, especially time management, during non-school hours" (Altun, 2008, p. 5). Amiryousefi (2016) synthesises the role of homework in the context of English language learning and speaks positively of increased immersion, improved self-regulation, opportunities to use acquired knowledge and achievement of better test scores. Obviously, it is common practice to employ homework for student learning to be effective (Bowman et al., 2014; Dodson, 2014; Richards-Babb, Drelick, Henry, & Robertson-Honecker, 2011). Another significant factor for success is connected to the grading of homework. A particularly positive impact on students' learning processes can be achieved if they receive a grade on their assignments (Albelbisi & Yusop, 2018). Lunsford and Pendergrass (2016) agree with this statement and add that the teacher can furthermore achieve an incentive effect in pupils by grading their homework.

All these elaborations support the view of homework as an integral part of education and will continue to be so. Yet, it is exactly this aspect of learning outside the physical classroom, which is currently undergoing a far-reaching transformation whose scope, consequences and end cannot yet be fully determined (Honegger, 2017). Online homework (from now on referred to as *OHW*) has become a compelling alternative method to the traditional pen-and-paper homework and finds more and more utilisation (Albelbisi & Yusop, 2018; Doorn et al., 2010; Lunsford & Pendergrass, 2016; Richards-Babb et al., 2011).

With new advancements and greater availability, recent technologies and the Internet have found their ways not only into many people's lives but also into the educational sector. Especially online media, as well as communication technologies are subject to rapid developments (Reinders & Benson, 2017). This can be paired with the observation by Dodson (2014, p. 354) that "[m]ore and more students are provided with computer access at school as well as at home[…]", with Altun (2008) providing similar findings. On all accounts, these technical developments open up new opportunities and challenges, not only for teaching in the classroom, but primarily for the realisation of homework (Elstad, 2016; Zhou, Chai, Liang, Jin, & Tsai, 2017). Bakla (2019) emphasises another essential consideration by stating that exposing students to new digital tools is beneficial for their adaptability "to the requirements of new practices in [the] digital world" (Bakla, 2019, p. 29).

Advancements in new media provide teachers with a modernised way of expanding school days beyond the limitations of the physical classroom via the use of technology and the Internet (OECD, 2015). Naturally, this has led to a fundamental change in the nature of homework assignments (Rhodes & Sarbaum, 2015). Despite the fact that e-learning has no universal characterisation (Fischer, Heise, Heinz, Moebius, & Koehler, 2015), OHW can definitely be identified as a constituent of computer-aided learning systems (Lunsford & Pendergrass, 2016). In its most basic form, OHW is defined as "any form of homework that needs to be completed via the Internet" (Zhou et al., 2017, p. 240). Here, two central concepts are indicated: utilising technology, mainly via the Internet, and working from home, away from school. Although the concept of OHW may sometimes be expressed by

closely related terms such as “web-based homework” or “online homework systems”, they all similarly describe “any system of computerized homework problems made to provide automatic grading and immediate feedback” (Albelbisi & Yusop, 2018, p. 145). Available task types are likely to be more varied than those of traditional homework (Zhou et al., 2017) and include numerous possibilities, such as multiple-choice, matching, drag-and-drop, gap fill and free response exercises (Lunsford & Pendergrass, 2016). The digital nature of these learning materials facilitates revision and adaption which is advantageous for retaining their quality in future times (Honegger, 2017).

Consequently, a new demand for online homework systems and platforms has been created. This is evident in the following remark, which affirms that “[t]he increase of internet-based information sources has led to the development of various online assignment sites serving several purposes” (Altun, 2008, p. 6). It has to be understood that this observation dates back more than ten years and thereby highlights only the beginnings of the transition to utilising the Internet for homework purposes. In more recent years, countless additional online homework systems have been created (Lunsford & Pendergrass, 2016). Even publishers have started to develop digital materials and management systems which accompany the respective coursebooks (Doorn et al., 2010; Lunsford & Pendergrass, 2016; Richards-Babb et al., 2011). Combined with recent findings that nowadays more and more 15-year-olds in PISA participating countries have regular access to the Internet (OECD, 2018), teachers increasingly tap into the opportunities this development brings along. As mentioned before, present-day students are considered d*igital natives*, which leads educators to argue favourably for utilising methods for homework purposes that the pupils are already familiar with (Dodson, 2014). This belief especially holds its value, when realising that “digital learners might be unable to use their full potential for learning the current educational system, which is predominantly led by digital immigrants [i.e. non-digital natives]” (Bakla, 2019, p. 17).

Thus, one of the main advantages of employing digital methods for homework purposes is the fact that they can function as an additional impetus for students to learn outside the classroom (Brandtzæg, 2016; OECD, 2018). Ergo, the strongly postulated studying processes out of school (Bowman et al., 2014; Dodson, 2014; OECD, 2018; Richards, 2015)

are ensured with OHW. Although limiting themselves to the subject of mathematics, Albelbisi and Yusop (2018) assert that the employment of online homework has already become a noticeable trend for complementing long-established approaches to teaching. And evidently, OHW should by no means be underestimated, because these "systems can be valuable learning tools" (Lunsford & Pendergrass, 2016, p. 533).

4.2. Cost and Benefits of Online Homework

As mentioned before, traditional pen-and-paper homework is increasingly supplemented and even substituted by various forms of OHW (OECD, 2018; Zhou et al., 2017). Here, the elaborations made in the first few chapters of this thesis, which discuss the superordinate goal of educating students digitally, must be considered again. Essentially, schools are in charge of equipping students with digital skills and competencies for their later life and career, which will be heavily digitally dependent. Bakla (2019, p. 18) confirms and states that "[s]tudents' ability to carry out some tasks and to create something on the Internet is essential for success in digital environments". In the framework of Austria's education system, the mediation of these digital competencies is assured in order to have students become versatile in the digital environment and prepare them for future developments. Solely if pupils are exposed to digital tools can they adapt to the requirements of digital life (Bakla, 2019). The choice of teachers to utilise an OHW system should, therefore, not only be seen as adjusting teaching methods to the habits of current generations, but also as a means to foster future-oriented, digital skills.

Yet, Dodson (2014) finds that although the educational landscape is, indeed, becoming increasingly digital, many classrooms still heavily depend on traditional, pen-and-paper homework. This raises the question of whether the unique advantages which can be attributed to online homework do, in fact, outweigh possible disadvantages. Naturally, the findings regarding this issue are, at a first glance, rather inconclusive and highly dependent on the actual school subject (Burch & Kuo, 2010; Richards-Babb et al., 2011; Wood & Bhute, 2019). Upon closer investigation, however, it becomes apparent that the majority of studies conclude that OHW "do[es] no harm", thus, as at least as effective as traditional pen-and-paper homework, frequently with decisive advantages (Albelbisi & Yusop, 2018;

Altun, 2008; Andrei, 2017; Aroroa et al., 2013; Bakla, 2019; Bowman et al., 2014; Johnston, 2002; Lunsford & Pendergrass, 2016; OECD, 2018; Perdian, 2013).

Further investigations into the topic by Doorn et al. (2010), however, bring forth the concept of "*cost"*, which juxtaposes the benefits to shortcomings according to several points of view from teachers as well as students. The subsequent chapters follow this dual perspective and thus shed a light on both sides that the employment of OHW systems can have.

4.2.1. Teachers as Determinants

Before thoroughly investigating the impact and effects of online homework on students, as well as teachers, one of the key determinants in employing digital learning tools has to be emphasised. The realisation of web-based homework is not only governed by the digital capability of the teacher, but rather by their willingness for the implementation thereof (Andrei, 2017; Lunsford & Pendergrass, 2016). This insight relates to costs for the educator "such as accessing a system, learning to use it and how it works for students, and determining the best ways to integrate it into a course" (Doorn et al., 2010, p. 3). Only if these factors are mastered is it then possible for teachers to develop the necessary confidence for using technology competently in the classroom (Andrei, 2017). That understanding is directly linked to the topic of digitally competent teachers (see chapter 3.1.2.). Only if teachers are convinced that digital media are effective for their subject and their specific class will they even consider resorting to them. It is, thus, not enough for teachers to merely believe in the overall potential of digital media for teaching and learning purposes, in order to bring about positive inclination towards utilising these digital tools (Honegger, 2017). The obvious consequence thereof is that teachers have to spend additional time on these processes. Especially the initial setup phase requires a rather extensive time investment. Furthermore, it lies in the remit of teachers to evaluate the availability and quality of online homework platforms (Arikan & Altun, 2007). Andrei (2017) sadly finds that this extra expenditure could deter even technologically well-versed teachers from supplementing their lessons with digital learning materials. As Lunsford and Pendergrass (2016) detect a close connection between a teacher's attitude towards OHW

and its realisation, it is, above all, vital not to be deterred by a possibly increased initial effort. If the instructor "is willing to make the effort to integrate it smoothly into the classroom experience" (Lunsford & Pendergrass, 2016, p. 541), they can rest assured that much more is possible for OHW than to "do no harm". And indeed, the impact that an employment of OHW on teaching and learning has can be manifold. Just to name a few, Doorn et al. (2010, p. 1) mentions "individualised questions and study plans, interactive involvement with the material, automatic grading, immediate feedback, convenience and student satisfaction" as some of OHW's unique advantages over traditional pen-and-paper homework. These effects are henceforth structured, firstly, into organisational implications, for both instructors and pupils, and, secondly, into observable effects on student motivation and performance. In the following, the former will be further broken down into different aspects.

4.2.2. Organisational Implications

First and foremost, online homework alters the medium that students have to work with, but it also has an impact on how they can interact with the coursework. Some costs are immediately obvious, such as those for teachers which, hence, lead to their role as determinants. Others must be unveiled via observations over longer periods of time or even systematic longitudinal studies. The inherent benefits mainly relate to new approaches of interaction which would normally not be possible with traditional pen-and-paper homework.

4.2.2.1. Teacher Time

One of the most predominant effects of an employment of OWH systems relates to costs and benefits in terms of time spent. As teachers normally have numerous students distributed in different classes, time management is essential for them to stay on top of things. Lessons have to be prepared, tests have to be assessed and homework has to be corrected, while keeping track of everything else that is happening in the classroom. Here,

OHW can help to free up part of a teachers' valuable time, which subsequently could be utilised for other purposes. However, before this benefit can be harvested, attention has to be put on the costs of the initial setup phase. As a first step, the quality of OHW platforms always has to be assessed and ensured by the instructor (Altun, 2008). This relates back to the previously mentioned insight of teachers, ultimately, determining whether these digital learning systems are even put to practice. Especially in the initialisation period, some parts of teaching time will be spent dealing with students' technical problems that arise during their contact with the OHW platform (Lunsford & Pendergrass, 2016). However, the authors reassure us that "[…] students, raised in the Internet age, adapt rather quickly to OHW systems" (Lunsford & Pendergrass, 2016, p. 539).

Having surpassed these above-mentioned costs, OHW can also have a rather remarkable impact on teacher workload (Bonham, Beichner, & Deardorff, 2001; Burch & Kuo, 2010; Dodson, 2014; Doorn et al., 2010; Lunsford & Pendergrass, 2016; Perdian, 2013). The process of issuing and collecting homework is optimised, which greatly decreases the necessary time for these tasks. Dodson (2014, p. 356) is convinced of the benefit that "[p]apers cannot get lost in transit from home to the classroom, and teachers can track exactly what time the assignment was complete [sic!] and submitted". Depending on the OHW system employed, the amount of time necessary for grading could be reduced in comparison to traditional pen-and-paper homework (Burch & Kuo, 2010; Dodson, 2014; Doorn et al., 2010; Perdian, 2013). Grading, thus, has become quick and easy to perform, with all the assignments of the students available in one resource (Dodson, 2014). Richards-Babb et al. (2011, p. 81) underline "incredible amount of time savings for the instructor as reason enough to use online homework." As some OHW platforms even offer an automatic grading system, this tendency can further be optimised. Then, teachers do not have to actively mark the entries of their students, but only supervise the students' achievement and provide help where necessary. With this automatic grading system, another benefit of OHW systems is addressed, namely the availability of immediate feedback.

4.2.2.2. Feedback

As discussed earlier, homework generally has to be graded in order to have the best effect on learning. Lunsford and Pendergrass (2016, p. 531) therefore state that "many students will simply not attempt homework unless it counts towards their grade". This realisation naturally applies to OHW as well. Hence, when teachers decide to employ a digital system for the realisation of homework, even if only as a supplement, it has to noticeably contribute to the students' grade. For that reason, assignments must be graded, and this feedback has to be given to the pupils. Only then is it possible for OHW to execute its benefits, both for pupils and teachers.

Here, a distinction between two different feedback systems, which both have a distinct purpose, has to be emphasised: *formative* and *summative* assessment. The former is characterised as any assessment which is utilised to provide feedback to the pupils, with the intent to foster and improve the overall learning processes (Ehlers, Guetl, Höntzsch, Usener, & Gruttmann, 2013; Lunsford & Pendergrass, 2016). Summative assessment, on the contrary, pursues the aim of evaluating and measuring the outcome of these learning processes (Lunsford & Pendergrass, 2016). Although both kinds of feedback systems can be realised via OHW, it is especially the formative assessment that is well-suited and holds the most educational value (Ehlers et al., 2013; Joyce, 2018; Lunsford & Pendergrass, 2016). Teachers have the chance of continuously monitoring the students' learning processes and intervene where possible shortcoming are identified (Ehlers et al., 2013). All these deliberations have to be understood with regard to the current developmental state and the thus resulting limits of employed OHW platform. Although they can automatically discern whether individual parts of an assignment have been conducted successfully or not, these systems are limited in their capabilities to provide intelligent feedback to certain task types which have an unlimited number of possible solutions (Honegger, 2017; Lunsford & Pendergrass, 2016; Perdian, 2013).

Still, the advantage of immediate feedback, represents one of the most important benefits, as it has a striking impact on the homework's effectiveness (Albelbisi & Yusop, 2018; Aroroa et al., 2013; Doorn et al., 2010; Lunsford & Pendergrass, 2016; OECD, 2018;

Perdian, 2013; Wood & Bhute, 2019). Real-time feedback on correctness cannot be realised with a pen-and-paper approach to homework, although this kind of assignment is better suited for certain task types (Richards-Babb et al., 2011). “Providing immediate feedback to students while they are completing an assignment is a quality that cannot be replicated with traditional paper-based assignments” (Perdian, 2013, p. 697). Real-time feedback is automatically generated by the system after students have completed an exercise, without any extra confirmation of the teacher. Thus, workload for the teacher is reduced significantly (Honegger, 2017). Normally, students need to submit their work and only afterwards receive the solutions from the teacher (Wood & Bhute, 2019), or wait until the next session for the comparison of their results. Richards-Babb et al. (2011), as well as Lunsford and Pendergrass (2016) were able to identify the feedback that OHW provides as an incentive for students to spend more time on the completion of tasks. Simultaneously, more time invested in homework results in an improved learning process (Richards-Babb et al., 2011) and increased achievement (Lunsford & Pendergrass, 2016).

Additionally, the nature of OHW systems allows for multiple attempts when completing an assignment. Commonly, only the highest or the average score is considered, which encourages students to try again when they did not get an answer correct in the first place. Although teachers can decide whether they want to permit or prohibit this feature, it is advisable to have it enabled (Kortemeyer, 2015). Students can utilise the automatically generated feedback of earlier attempts, which leads to a likely improvement of their score the following times (Doorn et al., 2010). Lunsford and Pendergrass (2016, p. 536) argue that “[s]ince the purpose of these assignments is formative, […] it is very important to allow students multiple attempts on each question”. Only then is it possible to take full advantage of the immediate feedback that OHW systems offer. Honegger (2017) indicates that learners feel less intimidated to have the computer rather than teachers tell them their mistakes repeatedly, thus resulting in a better disposition towards multiple tries. The increase of time allocated to the additional attempts aids students to understand what they did incorrectly in the first place (Doorn et al., 2010). However, Bowman et al. (2014) point to the possibility of an exploit thereof and, thus, state that “online homework systems could be altered to require an increasing amount of time between resubmitting

an answer for the same problem (i.e. each subsequent submission on the same problem would require a little more time)" (Bowman et al., 2014, p. 58). Via this slight modification it is feasible to have students think extensively before submitting again.

4.2.2.3. Communication and Monitoring

A further benefit of introducing OHW to teaching affects the communication of new tasks, as well as the monitoring of progress with current assignments. Digital homework platforms help teachers channel their contact with students and simultaneously allow the choice in the decision of when and where the assignments are to be worked on (Keefe-Cooperman, 2018; Lunsford & Pendergrass, 2016; Reinders & Benson, 2017, p. 569; Würffel, 2011). "Technology-enhanced learning may cover a wider range of "locations" (e.g. in class, in a computer lab, at home, while moving about)" (Reinders & Benson, 2017, p. 569). Furthermore, OHW systems store student input on the platform and have them continue from where they have left off (Würffel, 2011). Hence, students have greater liberty about where and when they want to start or finish, with the assignment being available at all times. Regarding the improved communication, the OECD (2018, p. 36) has found that an advantage of integrating such a system lies in "bridging the divide between school and home and allowing for more continuity between the two". It is often not only possible to assign new homework to students, but also to stay in contact with parents about the learning progress of their children (OECD, 2018; Würffel, 2011). Via this strengthened contact, it could even be possible to reduce inequalities in educational outcomes with respect to parental engagement (OECD, 2018). Consistent progress overviews that are available for teachers in connection with these new means of exchanging information with students and parents is beneficial for an early identification of pupils' deficiencies concerning their study habits. To underline this, Zhou et al. (2017) rightfully express their concerns about students that might use the online homework as a cover to follow their leisurely interest on the Internet. Especially here, close observation and communication with the respective students and possibly parents could reveal some hidden patterns which could then be counteracted. This insight immediately links to the next advantage of OHW systems which lies in the opportunity to track pupils' progress.

The permanent availability of the OHW platform is not only beneficial for students, but it can also help teachers to identify possible shortcomings throughout the class, as they too can access the platform and check at any time. As each pupil's progress is stored on the platform it can be monitored, and teaching strategies can be adjusted accordingly (Ehlers et al., 2013; Lunsford & Pendergrass, 2016; OECD, 2018). Moreover, Bowman et al. (2014, p. 48) extend this thought by declaring "[i]n addition to monitoring when students get questions right or wrong, online systems automatically gather information about number of attempts and time spent on the homework, whether or not an instructor chooses to look at those data". Here, the authors make a very fitting observation, as it might not be possible or economical to always analyse these additional layers of data. In general, this feature can be seen as rather intrusive, because it could unintentionally reveal information about study habits or computer access. Still, it cannot be denied that they are valuable for understanding possible obstacles for students and their learning strategies, which both would not be possible with traditional pen-and-paper homework (Roth, Ivanchenko, & Record, 2008).

4.2.2.4. Work Time

As mentioned before, there is an agreement that teachers should employ methods and approaches to teaching that the technologically minded generation of nowadays is familiar with (Dodson, 2014; Honegger, 2017). Yet, being a *digital native* is no guarantee for being good with technology. Bakla (2019, p. 16) rightfully states that "[i]t is possible to see even non-users or weaker users of digital technologies in a group of so-called digital natives […]". While pupils are likely to use digital media primarily for leisurely purposes outside the classroom (OECD, 2018), they often have limited contact with technology with regard to academic tasks (Bakla, 2019). Thus, it is observable that "[…] a significant number of the younger people fail to use digital technologies for academic purposes" (Bakla, 2019, p. 18), because their digital skills do not yet support their learning. Initial instruction time can be called for, especially when a new homework system is introduced, but Lunsford and Pendergrass (2016) restore confidence and assure us that modern pupils can adapt rather

quickly to novelties with OHW systems. In this context, teachers should go "without penalising early mistakes such as getting the formatting wrong" (Bowman et al., 2014, p. 58) and, instead, focus on content.

Another cost for both, teachers and especially students, is related to problems which cannot be solved by either party. This mainly involves technical issues like complications with student access, server crashes or loss of Internet connection at critical times (Andrei, 2017; Doorn et al., 2010). These technological difficulties could result in the necessity for a drastically increased time investment by students and possibly a forced repetition of several tasks. This counteracts the previously discussed opportunity of OHW for multiple attempts, because now students are induced to repeat a task, not because they choose to do so in search for their best performance, but because of system failures. Furthermore, these issues can have a negative impact on pupils' attitudes towards OHW systems and their motivation to utilise them in the future. Here, Doorn et al. (2010, p. 3) give hope and state "[a]ll in all, technical costs seen to be declining, although they are unlikely to disappear". In sum, teachers have to be aware of the possibility of technical problems and their most common forms that can occur with the OHW system that they are utilising in their teaching.

It has to be stated that in spite of all these inconveniences OHW can, if integrated properly, be beneficial for students' contact with a subject. Especially in language learning, students can profit from moving the learning process from the formal class setting to one that they are regularly engaged with in their leisure time, leading to lower anxiety and greater confidence (Reinders & Benson, 2017). This is mainly due to the previously discussed fact that OHW provides automated feedback, which circumnavigates the teacher as an obstacle (Honegger, 2017).

4.2.2.5. Individualised Learning

Another far-reaching benefit of OHW is related to aspects of individualisation, which describes a learning situation specifically adjusted to the individual student (Eisenmann, 2019). The already described effects of immediate and automated feedback, as well the

possibility for multiple attempts without additional penalties can prompt students to learn at a pace that is best suited for them (Doorn et al., 2010; Honegger, 2017; Würffel, 2011). Furthermore, the individual students can concentrate on skills they need to practice multiple times and thus improve in these areas. Ultimately, the individualised rate of learning is not limited to the pupils' actual completion of tasks, but it also encompasses their choice to pause or restart an audio file, to repeat a grammar task to get more answers right in the end, or to read certain passages of a text again (Honegger, 2017). As only some of these accommodations would be realisable with traditional pen-and-paper homework, OHW better caters to the preconditions of the respective pupil. Lunsford and Pendergrass (2016) find that students are more willing to ask questions when an OHW system is employed, which can in turn lead to more individually tailored feedback by the teacher. Via OHW, the activities tend to become more "tailored to fit the student's learning needs" (OECD, 2018, p. 32). Eisenmann (2019, p. 72) synthesises the role of digital media in supporting individualised teaching by stating that "[t]he targeted use of digital media in individualised and differentiated teaching and learning contexts are extremely motivating, and the variety of media enables autonomous learning through a moderate, critical, and individualised approach". These findings are especially relevant for vocabulary learning purposes. Abrams and Walsh (2014) are of the opinion that individualisation plays a specifically important part in this context, because a multimodal approach to vocabulary instruction can entice pupils to study independently and "empowers [them] to be agents of their own learning" (Abrams & Walsh, 2014, p. 57).

4.3. Digital Exclusion and other potential Problems of Online Homework

As discussed earlier, "digital technologies are participatory in nature" (Bakla, 2019, p. 16), which presupposes students' access to them in order to render active participation possible. It has been demonstrated that the simple availability of technology is not enough for effective learning purposes, but still it is a necessary step in its realisation (Andrei, 2017). The OECD (2018, p. 8) very fittingly gives insight into this matter by stating that "availability, accessibility and quality of ICT resources partly shape teachers' and students' practices with ICT, both in and outside of the classroom". Also Bakla (2019) arrives at a

similar finding and underlines the access to technology as a vital determinant, which undoubtedly also concerns the generation of d*igital natives*. In digital learning contexts, it is thus imperative that students are provided with a personal, fully functional device, if only for the period of time that they are working with it (Honegger, 2017).

Obviously the availability of digital technology depends on financial resources that have to met (Doorn et al., 2010). Indeed, advancements in the technological sector have made digital devices more affordable (European Institute for Gender Equality, 2018), but they can still be an expense that many students or families simply cannot afford. A concise quote depicts the global situation: "Although digitalisation is progressing at an impressive rate around the globe, there are substantial differences in ICT access and quality across countries, regions and educations systems" (OECD, 2018, p. 14). Furthermore, individuals of specific sectors of society might face similar problematic circumstances. Regional differences can govern students' access to technology, because the general availability of digital infrastructure in their country strongly determines what is available and recommended in schools for learning purposes (OECD, 2018). The problems are especially evident with disadvantaged population groups, in relation to "computer ownership, time spent using computers or the internet or even the age when a person starts using computer technologies" (European Institute for Gender Equality, 2018, p. 41).

In recent years, mobile phones have expanded their functional range more than ever and, thus, students often resort to these devices for their contact with digital learning materials. Additionally, increasing screen sizes allow for more information to be displayed simultaneously. However, as Bakla (2019) states, the utilisation of some programmes or websites could prove to be rather challenging on these mobile devices. Indeed, a smartphone cannot be considered a substitute for a fully-fledged computer system, because it does not offer the same level of interaction. Yet, the problem of access to digital technology is not solely a financial question, but also a matter of quality. The OECD (2018, p. 8) explains: "[…] slow Internet connections would prevent students from using demanding online digital learning resources, while students working on poorly maintained computers would likely encounter software compatibility or obsolescence issues". In other words, even if students are able to gain access to digital learning materials, it should be

with rather recent hardware and a stable Internet connection. Only then can it be guaranteed that all features of the respective learning platform are fully operational. If these presuppositions are not fulfilled, they could see themselves involuntarily excluded from learning via digital media. Subsequently, these circumstances might promote an increase in what is referred to as the *digital divide* (Brandtzæg, 2016; OECD, 2018). It is a phenomenon which is usually related to an inequality between people that either have, or do not have access to digital media and the Internet (Brandtzæg, 2016). Sadly, this represents an inherent problem which the implementation of digital technology into the educational sector is connected to. In this context, (Brandtzæg, 2016) issues a warning by stating that digital media could involuntarily operate against their original intention of an inclusive digital society. Hence, schools must embrace their critical position in this matter and do their best to counter this unfavourable dilemma.

Honegger (2017) recapitulates availability and reliability as prerequisite for the employment of digital media in teaching. Here, the author emphasises his vision of *one laptop per child* as the ultimate goal towards digitalisation in education and discusses approaches of how it could be achieved. Yet, with technologies becoming increasingly diverse and specified, the acquisition of them could pose a logistical, as well as a financial challenge. On the one end of the spectrum, the most attractive realisation is called *bring your own device*, in short *BYOD*. Students bring and use their private devices in and out of class for school purposes. Although this approach sees a wide prevalence, for example in Austria in the context of *Basic Digital Education*, it is sometimes argued that BYOD jeopardises students' equal opportunities. This is chiefly due to previously discussed financial considerations and the fact that children from better financial backgrounds will be able to afford more powerful devices and thus have better access to the digital learning materials. The other end of the spectrum is defined by standardised, collective purchases on the part of the school. Whereas this ensures equal overall quality and comparability, it could lead to pervasive disputes and conflicts among the people responsible for the decisions about the most appropriate computer systems, as well as operation system. Certainly, there exist additional nuances between the two described realisations, which are hybrid forms thereof, for example BYOB with additional subsidies in the form of

supplemental devices provided by the school. Still, it is undoubtedly true that via the approach of BYOD schools can stay out of the decision-making process in what technology to utilise, and transfer this obligation to students, or their parents. This might free resources for the school to work on diminishing inequalities in terms of digital access (Honegger, 2017). It should become clear that different approaches to the financial aspect in the employment of digital media exist and that they should always be considered with respect to current circumstantial factors on a student, school and at the nationwide level.

As has been demonstrated in the context of Austria, the transition to digital technology in teaching is incremental. Here, the choice is on BYOB, with a supplement of digital devices at school that can be used by students who would otherwise not have access to a device. Encouraged by a similar observation of the situation in Ohio, USA, Dodson (2014) raises the hope that the digital transition of classrooms might not even pose such a big challenge. When analysing teaching that is complemented with technology, Ulbing (2013) is also convinced that it is currently enough for students to have access to a computer outside of regular lessons. This way pupils are not disadvantaged, and an increase of the digital divide could be circumnavigated. Still Honegger (2017) maintains his stance by asserting the current state is only a step towards the direction of the targeted one-to-one equipment of students.

With this in mind, it can be deduced that incorporating digital learning into teaching is not simply a question of the teacher's willingness and motivation, but a question of circumstantial factors in connection with availability and accessibility. I concur with Arikan and Altun (2007, p. 366) who state that "[a]ccess to technology should be provided when asking for the work that requires the use of technology" (see also Altun 2008). Up to now, however, teachers are responsible for finding different approaches and alternative ways of working with digital materials for those students that do not have access to the Internet or suitable computers (Altun, 2008; European Institute for Gender Equality, 2018). These deliberations also relate to the learning platforms that are used with pupils. Here, teachers should strive for an incorporation of tasks and assignments that do not require the use of additional programmes that might even be connected to additional costs (Altun, 2008).

The European Institute for Gender Equality (2018, p. 37) makes a point by stating that "[o]verall, access to and use of digital technologies goes hand in hand with the level of an individual's digital skills and their motivation to use and enhance those skills". Hence it is clear that only if the inherent issue of students' access to computers and the Internet is resolved will the advantages of teaching and learning with digital media, such as online homework, take effect.

4.4. Student Engagement, Attitude and Motivational Aspects

With the previous chapters thoroughly concentrating on the organisational costs and benefits that accompany the introduction of online homework, the focus is now on the implications for students' learning processes and for their feelings towards using these systems. With OHW, it is possible to observe positive effects on pupils' attitudes, engagement, as well as motivation (Albelbisi & Yusop, 2018; Altun, 2008; Andrei, 2017; Dodson, 2014; Dorfinger, 2019; Lunsford & Pendergrass, 2016; OECD, 2018; Richards-Babb et al., 2011). To set the tone, two findings by Bakla (2019) underline the opportunity, but also the challenge that OHW systems face in respect to the students of today. By comparison of the fact that "[…] digital natives basically look for enjoyment in the activities they do in digital environments" (Bakla, 2019, p. 18) to the observation that "digital technologies are used more frequently in daily life than in academic settings" (Bakla, 2019, p. 27), the delicate matter of OHW systems becomes apparent.

A predisposition of *digital natives* toward the utilisation of digital technology is evident, which at the same time is strongly connected to their strive for enjoyment. At the same time, the utilisation of digital technologies in the context of education is not prevalent, because *digital natives* prefer to use them for leisurely or everyday activities. Nonetheless, the interactive design of many digital media can exert a distinctive attraction or drawing power, which naturally also acts motivational in learning contexts (Abrams & Walsh, 2014). Hence, it proves to be a most viable decision for teachers to combine meaningful assignments that are subject related with enjoyable opportunities for students to apply and enhance their digital skills (Altun, 2008). That way it is possible to transfer the

motivational benefits that commonly accompany the interaction with digital media to the contexts of teaching and learning (Honegger, 2017). A quote from the domain of language teaching gives a suitable insight, which states that "a learner may either develop the motivation to interact with a technology and in turn be motivated to learn a language, or vice versa." (Adolphs et al., 2018, p. 174). This suggests that the motivational implications of digital media and OHW are transferable to language learning contexts and that this influence can even operate in both directions.

As exemplified beforehand, access to well-functioning computers is mandatory for any motivational benefit to occur. Altun (2008, p. 16) specifies this necessity in the context of students' sentiment towards OHW and states that "[c]omputer ownership and increasing proficiency in computer and internet use affects students' attitudes towards OHS [=online homework systems] positively". Other studies also show that, if access is granted, students are noticeably positively inclined towards the utilisation of OHW and their attitudes were strikingly favourable (Albelbisi & Yusop, 2018; Dodson, 2014; Richards-Babb et al., 2011). Above all, this is due to the fact that pupils' engagement with homework is fundamentally affected. Here, engagement "refers to the intensity and quality of students' involvement in initiating and carrying out learning activities" (Yang, 2011, p. 182). Those children who already have a positive opinion about the use of digital media will invest more time and effort on homework and will think better of it, if they can utilise digital technologies for their assignments (OECD, 2018). This is indeed a very valuable insight, as a positive attitude of students towards homework is desirable for teachers.

In this context, Altun (2008) reminds us that factors such as grade, age, access and frequency of computer and Internet use can also have an influence on students attitudes towards OHW systems. As discussed beforehand, some of these have a gatekeeping function, while the factors age and grade mainly relate to differences in study habits, with younger students being less effective in their studying and more easily distracted than older students (Altun, 2008). Nonetheless, pupils who are highly motivated or are well organised regarding their learning documents and materials evaluate the potentials of working with a technology-enhanced system more positively (Doorn et al., 2010). In this context, Brandhofer et al. (2019), as well as Dorfinger (2019) are able to deduce a

comprehensive finding of students expressing an increase in their perceived joy of learning. Arguably these findings are cause for the observable boost of student engagement when teachers choose to employ digital technologies in their classes (Andrei, 2017; Lunsford & Pendergrass, 2016; OECD, 2018). Here, Lunsford and Pendergrass (2016, p. 532) state that if introduced properly, OHW systems can help that "more students keep[…] up with the course material", which is on all accounts beneficial. It not only holds value for student engagement outside, but inside the classroom as well. This increased commitment relates to students practicing more with online assignments at home (Lunsford & Pendergrass, 2016), which translates to them being better prepared for the face-to-face classes in school. This could pave the way for a more sophisticated exchange of knowledge and experiences about the topics that are covered at school. Both these factors, students' positive attitudes to and better engagement with OHW, are connected to a boost in student motivation concerning their utilisation of these systems.

To fully comprehend the impact of OHW on students, relevant aspects of motivation have to be further defined. Generally, motivation refers to a multifaceted concept in which emotional and cognitive arousal lead to the decision of carrying out an action with varying intensity in order to achieve a previously set goal (Bodnar, Cucchiarini, Strik, & van Hout, 2016). Dörnyei and Ushioda (2011, p. 3) clarify the fundamental notion of motivation theory and its strive to answer the question of "[w]hat moves a person to make certain choices, to engage in action, to expend effort and persist in action". In other words, motivation refers to the direction and magnitude of human behaviour, while governing why, how long and how hard people focus on and carry out a certain activity (Dörnyei & Ushioda, 2011). Thus, it is obvious that motivation also represents an important factor for learning processes. Especially the context of language learning has recently been enjoying great interest by many researchers (Lamb & Arisandy, 2020). Bodnar et al. (2016) are able to deduce that the motivational experience of students during an assignment has a direct impact on their actual behaviour in these assignments. Hence, it is certainly desirable to keep pupils' motivational experiences at a high level, because these can affect their practice, as well as their inclination towards the connected learning processes. Naturally, not all assignments given by teachers show the same motivational affordances,

but it is at exactly this position, where the OHW systems could prove to be gamechangers. Although these digital homework systems, by default, tend to cater to the likes of *digital natives,* they still have to be analysed individually according to their motivational impact (Bodnar et al., 2016). In this context, it has to be understood that motivation is, indeed, an abstract construct which is not directly observable and "multifaceted, and dynamically changing [in] nature" (Dörnyei & Ushioda, 2011, p. 198). Due to this insight, the two authors urge a definition of the relevant aspects of motivation which are targeted in the investigation of a particular study.

As this thesis investigates motivational experience of students in the context of an employment of OHW systems, it only focuses on the pertinent aspects of motivation for this specific purpose. In other words, it is not the intention to present what Bodnar et al. (2016) call a *global* analysis of motivation in the context of digitally assisted language learning. This decision is in line with Boo et al. (2015) who differentiate between two categories of motivational research in second language learning. The first, "motivatION [original emphasis]" (Boo et al., 2015, p. 149) research is connected to the rather conceptual side of research, which tries to understand and explore motivation as a theoretical construct in relation to learning. The latter, "motivatING [original emphasis]" (Boo et al., 2015, p. 149) studies link to a rather practically oriented investigation of how a learner's motivation could be increased with particular methods or approaches. From this insight it follows that the present thesis is definitely to be considered as part of the second category, as the practical example of OHW is examined in relation to a possible boost in students' motivational experience.

For that purpose, the concept of situational motivation is particularly relevant, because it explores different contextual aspects that have an impact on learner motivation in actual learning situations. Here the interest of how computers and digital media can affect pupils' motivation inside and outside the classroom is situated (Bodnar et al., 2016). One approach to investigating situated motivation focuses on studying "student participation and involvement, emotional engagement referring to positive and negative attitudes to the practice environment, and cognitive engagement as the willingness to expend effort towards learning" (Bodnar et al., 2016, p. 196). Knowledge of how these aspects are

affected by the introduction of OHW systems can foster a better understanding of its overall motivational impact and thus can help in explaining practice behaviour of students (Bodnar et al., 2016).

In this context, it is fitting to mention relevant aspects of the self-determination theory (SDT) developed by Deci and Ryan (1985). The framework focuses on the problem of how learner-internal motivation can be induced as well as fostered (Bodnar et al., 2016). This approach builds on the widely known differentiation between intrinsic and extrinsic motivation, where SDT defines two extremes of the spectrum, namely intrinsic motivation and the opposite of amotivation. The former resembles an individual's strive and willingness to perform an action, which is in itself interesting, captivating as well as challenging (Deci & Ryan, 1985; Schiefele & Köller, 2018). In other words, the activity is carried out because of itself and thus virtually functions as its own reward (Schiefele & Köller, 2018). Dörnyei and Ushioda (2011, p. 23) define intrinsic motivation as dealing with "behaviour performed for its own sake in order to experience pleasure and satisfaction, such as the joys of doing a particular activity or satisfying one's curiosity". Therefore, this aspect of motivation is the most desirable, both in educational as well as non-educational contexts. Amotivation, on the contrary, refers to the total absence of this motivation and thus resembles "a state of complete disinterest in an activity" (Bodnar et al., 2016, p. 189). Between those two extremes, SDT defines varied types of extrinsic motivation, each with a different degree of internalisation, which subsequently refers to the agreeableness of extrinsic factors to individual beliefs, values or goals (Bodnar et al., 2016; Deci & Ryan, 1985). Essentially, the state of external motivation in induced by the strive for a reward or the prevention of negative consequences (Schiefele & Köller, 2018). If a learner's task, now, gets increasingly in line with these personal interests and goals, the condition of motivation becomes progressively intrinsic and thus results in greater exerted effort (Bodnar et al., 2016; Dörnyei & Ushioda, 2011). This is a delicate matter, as external reward can sometimes evoke the exact opposite of what they originally aim to elicit, namely boosting motivation and hence also effort in a specific task. In other words, students might feel continuously less intrinsic motivation for a normally very motivating action when a reward is offered. This phenomenon is called the "overjustification effect"

(Deci & Ryan, 1985, p. 197) and relates to an individual's post-activity attribution of reasons for their actions. The external cause for the previously carried out activity undermines the intrinsic motivation for future actions (Deci & Ryan, 1985). Dörnyei and Ushioda (2011, p. 24) underline this insight and state, "students will lose their natural intrinsic interest in an activity if they have to do it to meet some extrinsic requirement". Therefore, teachers must be aware of the overjustification effect and avoid it as best as they can in teaching.

The well-established concept of *self-efficacy* by Bandura (1977) represents an further relevant field of motivational theory for this thesis. This theory deals with an individual's judgement of their capabilities to overcome complex or difficult tasks and challenges (Bandura, 1977). These beliefs govern people's choice of actions, level of ambitions, degree of exerted efforts as well as overall endurance (Dörnyei & Ushioda, 2011). In the case of a low sense of self-efficacy, it could even hinder people from participating. "[P]eople will not typically engage in a behavior […] if they do not expect that there is a good chance of their succeeding at the behavior (i.e., of their being efficacious)" (Deci & Ryan, 1985, pp. 218–219). Therefore, also in this case a possible danger for teaching can be deduced. If students believe that their skills are not up to par for given tasks or assignments, they could classify these as "threatening" (Bandura, 1977, p. 194), and thus entirely avoid them. Lamb and Arisandy (2020) make a very fitting observation about the importance of students' self-efficacy in respect to the utilisation of digital media. The two authors find that those pupils who consider their own technological abilities as better and so exhibit higher levels of self-efficacy, tend to use more technology for learning purposes than those with lower levels (Lamb & Arisandy, 2020). Also the OECD (2018, p. 49) confirms "that higher levels of ICT self-efficacy are associated with higher levels of learning outcomes". This insight can be combined with a remark that has been made earlier in this thesis. Especially in the initial phase when students become acquainted with a new OHW or other digital learning system, teachers should mediate confidence and likewise refrain from assessing formatting and primarily focus on content (Bowman et al., 2014). The thus supported confidence of students acts as a strong determinant for their level of proficiency

in engaging with digital media, as well as their ability to utilise them for learning purposes (OECD, 2018).

As presented beforehand, positive motivational effects are, indeed, observable with students when working with digital media, such as OHW systems. Here, another important factor of motivational research comes into play, namely what Csikszentmihalyi (1985) refers to as *flow*. It describes a "holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi, 1985, p. 36). Individuals experience coherent or fluent transitions between actions from one instance to the other (Schiefele & Köller, 2018). It becomes clear that this notion is strongly connected to the previously discussed concept of intrinsic motivation. The state of flow, however, represents the highest possible performance and effectiveness thereof (Schiefele & Köller, 2018). The quote, "flow […] is the crucial component of enjoyment" by Csikszentmihalyi (1985, p. 11) links the current train of thought back to the examination of motivation in the context of digital media, as well as OHW utilisation. These kinds of technologically enhanced learning techniques can prompt students to be more involved in their utilisation, which can ultimately lead to the experience of flow. Here, the temporal persistence of these motivational effects must be mentioned. Flow is characterised as a channel located between anxiety and boredom and, naturally, when actions or tasks are repeated frequently without any alteration or increasing difficulty, they could lose their motivational potential (Csikszentmihalyi, 1985). Hence, the novelty of digital learning systems plays an important role, but as Würffel (2011) emphasises they should never be introduced into teaching just because they are *new*. Also Honegger (2017) articulates this insight and reiterates that early motivational benefits that accompany an introduction of digital media into teaching typically wear off rather quickly. When done properly, however, it is possible to maintain "the positive motivational impact on learners, even when initial novelty effects wear off" (Lamb & Arisandy, 2020, p. 87). This is mainly connected to the previously examined benefits of OHW and other digital learning tools, for example via increased learner autonomy and individualisation (Lamb & Arisandy, 2020).

In the discussion of the relevant aspects of motivational theories and research, the pertinent points of contact with OHW and other digital learning tools have been identified

and discussed extensively. However, there is one crucial aspect that has not yet been mentioned, namely the intertwined issue of frustration. This feeling mainly emerges when the previously set "path to the goal has been blocked and the person sees no way around the barricade" (Deci & Ryan, 1985, p. 232). Frustration can seriously counteract the earlier described organisational and motivational benefits that accompany an introduction of an OHW system and thus represents one of its biggest downsides. Indeed, digital technologies are more prone to malfunction or incompatibilities than traditional approaches of pen-and-paper homework. These problems generally relate to technical issues with hardware or software (Doorn et al., 2010; Dorfinger, 2019; Lunsford & Pendergrass, 2016) but can also include provider-problems such as account access (Doorn et al., 2010) or server crashes, which lock student out at critical times (Johnston, 2002). If these issues cannot be handled by students on their own or are not resolved in an adequate timespan, they could lead to emotional responses in the form of anger or upset (Deci & Ryan, 1985). Subsequently, the once perceived motivational gains are reverted and pupils, but also teachers might think differently than before about doing homework online (Lunsford & Pendergrass, 2016). Certainly, this outcome will only happen if the problems occur on a regular basis and frequently hinder students from engaging with the OHW system. An elementary solution to this problem is brought forth by Lunsford and Pendergrass (2016), who remind teachers to keep a certain flexibility in this matter. If an online system becomes unavailable due to external reasons, it should be the first step to extend the due date and thus comply with the students' situation.

Lunsford and Pendergrass (2016, p. 541) bring forth a suitable synopsis to the investigation of OHW and its effects on students engagement, attitudes and extensive motivational implications. The authors acknowledge that OHW cannot be seen as a "magic bullet", but it still can hold extensive value for teachers and students, if introduced properly. These digital systems should not be regarded as ultimate miracles, but rather as having the potential to positively affect the way students engage with homework. Still, it is necessary to also calculate possible downsides into the assessment of the respective OHW system in the given context. In the following, the thesis turns towards this step and thus to the testing of the theoretical elaborations in the real-word employment of *MORE! Cyber*

Homework. The findings show that this OHW platform is, indeed, not a *magic bullet*, but it can have positive motivational effects on students and also offers desirable organisational opportunities.

5. Research Project

This part of the master's thesis addresses the empirical investigation of *MORE! Cyber Homework* as one particularly common and well-established example of OHW systems in Austria. The incentive for the present investigation is expressed in a very suitable quote by Lunsford and Pendergrass (2016, p. 540):

> Choosing an OHW system, like choosing a text, is an important part of teaching a class. In fact, the two choices are closely related. If you currently use a text that you are happy with, we recommend choosing an OHW system that is customized for that text, if at all possible.

Hence, the superordinate aim is to assess one specific OHW system according to its qualities and subsequently come to an individually tailored solution that takes into account the Austrian curriculum, as well as the given contexts of the participating students. Therefore, the goal is to test for the previously discussed costs and benefits that accompany the implementation of such a digitally assisted homework system and to set the findings in relation to the deliberations about Austria's new school subject of *Basic Digital Education.* For that purpose, the attitudes and opinions of 95 lower secondary students of two schools in Vienna were investigated via an online questionnaire designed especially for this purpose.

The topic has gained additional relevance, as during the originally planned timespan of conducting the survey the Covid-19 pandemic started. Thus, the original plan had to be revised and adapted to the latest circumstances. As during the distance-learning phase students had to work via the Internet from home, the OHW platform *e-zone* saw an increased utilisation and, hence, was on the pupils' minds. Therefore, it was possible to capture students' attitudes towards this digital homework system, *Cyber Homework* more thoroughly. Furthermore, it was feasible to explore a potential shift in their perspective due to the circumstantial increase of overall computer usage because of its employment for all contact with school and for subjects other than English. The structure and procedure of the survey, as well as which data was collected and the means of its analysis, will be described in the following chapters.

5.1. Topic of Investigation

As mentioned above, the aim of the research project is to empirically study the claims voiced in literature in relation to an actual implementation of an OHW system in the learning environment of Austrian students. Here the focus lies on the analysis of whether these claimed costs and benefits are indeed verifiable and what connections between influencing factors about students' motivation for and attitudes towards *Cyber Homework* can be drawn. Taking all these elaborations into account, the present thesis builds on the background knowledge established via research question 1 and enhances these findings with an answer to research question 2:

Research question 2: Does the utilisation of *MORE! Cyber Homework* exhibit desirable outcomes in regard to organisational costs and benefits, as well as motivational effects for the students surveyed?

The analysis of *MORE! Cyber Homework* regarding its usefulness in the context of *Basic Digital Education* and therefore a preliminary answer to the first research question has already been established in chapter 3.3.. It has been demonstrated that although the *e-zone* is indeed a feasible and modern means of achieving a number of the newly postulated digital competencies by the curriculum, it most certainly does not and cannot cover all of them. The empirical study now builds on this background knowledge and complements it by exploring the students' self-assessment of relevant competencies, such as aspects of access and computational thinking.

The second research question deals with the unique case of *MORE! Cyber Homework* and lies its focus on student attitude, engagement, and motivational aspects of lower secondary pupils in Vienna, Austria. Even though evidence for the existence of previously described effects and their impact on the learning processes is brought forth in various sources, it is, however, neither strictly related to language learning, nor to this particular form of OHW systems. Hence, the specifically created quantitative questionnaire will generate data which subsequently will be used to investigate those aspects. This data will be used to test for the following hypotheses:

H1: Organisational benefits of *Cyber Homework* are verifiable and well received by students regardless of sex or age.

H2: *MORE! Cyber Homework* has a positive impact on students' motivational aspects and attitudes towards the online learning platform, with slightly more beneficial outcomes for younger students.

H3: The Covid-19 pandemic and connected breakdowns of the e-zone are evident in the students' retrospective perception of the learning platform.

5.2. Research Design

The rather extensive theoretical knowledge gained via the literature review was grouped and transformed into variables, which subsequently were empirically examined. Due to the circumstance of the Covid-19 pandemic, the quantitative questionnaire of the study has been transformed into an online format. The survey took place in two Viennese AHS schools (= "allgemeinbildende höhere Schule", which describes the British Grammar School), namely the GRG 21 Bertha von Suttner – Schulschiff, as well as the RG 18 Schopenhauer – Realgymnasium. To guarantee comparability, both schools are located in the same province and employ the schoolbook series in question for their English teaching, i.e. *MORE!* (Gerngroß et al., 2016).

5.2.1. Research Group

Lower secondary students of the two above mentioned schools were chosen to participate in this study and participation was strictly voluntary. Beforehand, pupils and their parents or legal guardians were thoroughly informed about the topic of investigation and about the form of the questionnaire. In order to render age related differences of results more distinct, primarily students of first and third form, i.e. grade five and seven, have been elected. These participating students are, however, not limited to certain classes or teachers, but rather a wide spectrum of individuals throughout the schools was covered. Students were contacted directly and when willing to participate, the consent of respective

parents or legal guardians had to be proven (see appendix). It was a concern that each and every pupil who took part in the questionnaire had had extensive and regular contact with *MORE! Cyber Homework* beforehand. For that purpose, the teachers of the respective classes were contacted concerning this matter. As the OHW platform was not unchartered territory for the students asked, it was possible to gain further specified and contextualised information about their attitudes, engagement, as well as experienced motivational effects towards the OHW system. Furthermore, it has to be mentioned that all participants were exposed to a continuous and even more extensive contact with the *e-zone* during the Covid-19 pandemic. This fact is essential, as further observations about a possible change of attitude towards the Cyber Homework during that period of time can only be made, if all test subjects involved fulfil this criterion.

A total number of 95 out of 204 students contacted successfully completed the questionnaire. Here, it has to be mentioned that two of the twelve classes questioned are regularly taught by the author of this thesis. Each of the two consists of 17 to 18 students. This could have an influence on the pupils in question and possibly evoke a trend towards outcome that is assumed to be desired by the teacher. To counteract this problem, it was made sure to communicate that the completion of the questionnaire was neither tractable to individual students nor classes. Hence, the exact number of respective students was and could not be recorded, but this circumstance could still have an influence on overall results and thus should be kept in mind.

5.2.2. Cyber Homework

The *e-zone* platform by publisher *Helbling* accompanies the widely utilised schoolbook series *MORE!*, which is designed for lower secondary students of English. The *Cyber Homework* functions as a further opportunity for learning and exists additionally to the characteristic set of *Student's Book* and *Workbook*. The *e-zone* represents the central hub for this purpose, with the *Cyber Homework* being its most essential constituent. Each digital homework is dedicated to a certain unit of the accompanied schoolbook and consists of a number of individual tasks that all cover practice for a certain language related

competence, such as listening, grammar, reading or vocabulary. One instance of *Cyber Homework* approximately takes about 20 minutes to complete, while it is possible for students to employ multiple attempts in the strive for the best score. Further descriptions of the *e-zone* and the *Cyber Homework* can be found in chapter 3.3..

As part of the empirical investigation, it has to be mentioned that during the Covid-19 pandemic, the *e-zone* learning platform, naturally, saw a dramatic increase of simultaneous users from all over Austria. This led to a state of both teachers and students having difficulties accessing the provided services. The publishing house quickly responded with an official message on their landing page, stating that the enormous number of visitors on the *e-zone* leads could lead to temporary outages and that they were working on a solution to the problem. However, as time went by and distance-learning continued to be used in full force in the spring of 2020, the problems of accessing the website never stopped. These issues included that students could not access their *Cyber Homework*, were not able to log in with their credentials, had to wait excessive amounts of time for the pages to lead, or were simply kicked out after the completion of an exercise, only to realise that the *e-zone* had not saved their progress. Hence, it is especially interesting to see whether these problems have led students to experience frustration and, as a result, if a negative impact on the way *Cyber Homework* is perceived generally is to be made out. It has been possible to adapt the questionnaire for the investigation of this aspect.

5.2.3. Methodology

For data collection, a questionnaire in online form was used to acquire data from lower secondary students (see appendix). The choice to employ a quantitative approach for the empirical investigation was made because of the aim to examine a large scale of individually perceived effects of *Cyber Homework* by students. In other words, the possible implications voiced in the literature review were tested with this specific form of an OHW system for a considerable number of students. In order to guarantee comparability and cater to this many participants the choice has been made for employing “closed-ended items, which do not require the respondents to produce any free writing” (Dörnyei, 2007,

p. 105). After questions about demographical data, a five-point Likert scale was used, which ordinally ranks the students' agreement to utterances (Busch, 1993) about the learning platform. The employed choice is in line with an observation by Bodnar et al. (2016), who state that this approach to quantitative testing is often evident when researching computer assisted language learning, especially in connection to motivational aspects. The scale ranges from agreement (5 = "Ich stimme zu") to disagreement (1 = "Ich stimme nicht zu"), while still allowing for an indecisive response (3 = "weder noch"). Two further divisions, each between the respective extreme and the midpoint should indicate the tendencies of students. As all response options are evenly spaced and labelled, the utilised format is considered to be typical for a Likert scale (Nadler, Weston, & Voyles, 2015). This uniform distribution of answers was employed in order to guarantee an equidistance between options and thus allow for an analysis with metric scales, which is common process in social sciences (Döring & Bortz, 2016).

Furthermore, the choice to employ a five point scale has been deliberately made, as it is reportedly the optimal range of increments for this scale type (Nadler et al., 2015). The question whether or not to include a mid-point is highly debated (Busch, 1993; Nadler et al., 2015; Ron Garland, 1991), with distinct recommendations and implications for different research purposes. As the test subjects in the underlying survey are young and most likely have never come into contact with a Likert scale design before, the mid-point was introduced to allow for an indecisive answer and not to push students into one direction. These considerations are in line with what Nadler et al. (2015, p. 73) mean by stating "[t]he optimal number of response options is a debate based on how simplistic a scale can be while still maintaining validity and reliability as interval data".

Here, it has to be mentioned that the questionnaire is written in German, as this represents the main educational language of the pupils surveyed. Additionally, as the students are, roughly speaking, beginners of English, their proficiency in that language is not yet adequate for a scientific investigation without any language related support from third parties. Visual support for the respective degrees of agreement was given in the form of universally standardised smileys. Busch (1993) affirms that textual or graphical labelling only have an insignificant distorting effect on results. Hence the use of German, in addition

to visual cues hopefully counteracted misunderstandings in questionnaire design as well as content, and therefore also inhibited false results. This picks up on a though brought forth by Dörnyei (2007, p. 108), who emphasises to "[u]se simple and natural language" when creating a quantitative questionnaire. I made sure to avoid utterances with negative constructions and subjective terms such as "never, rarely, sometimes, often, and always" (Busch, 1993, p. 734), which diminish the ordinal comparability in the evaluation. Furthermore, it has to be noted that not only the Likert scale, but the complete questionnaire was designed with closed-ended questions. That way it was possible to decrease the students' hassle and guarantee utmost comparability in the evaluation of the answers to an item.

After the design process and several revisions of the questionnaire, I transferred it into an online format via the use of SoSci Survey. The overall structure consists of initial demographic questions, about sex, age and grade. As it is not the aim to indicate possible differences between the two schools, an indication about the affiliation of the pupils was consciously left out. This was followed by an inquiry about computer access and usage at home, both before and during the Covid-19 pandemic. Subsequently, two pages with variable-specific utterances about *MORE! Cyber Homework* were presented. Students were instructed to tick the corresponding five-point Likert scales and thereby mark their agreement to the respective statement. There were 36 items in total, presented with a consistent design, but in a randomised item sequence. The variables tested consisted of *motivation towards Cyber Homework, motivation computer usage, technical versatility, experienced accomplishment, learning effect, intrinsic motivation to do the Cyber Homework* and *frustration.* Each variable consisted of at least two corresponding items. Acquired results in this context were primarily utilised to investigate H1 (Hypothesis 1) and H2 (Hypothesis 2), with regard to age and also gender differences. Furthermore, variables for example *motivation toward Cyber Homework* and *motivation computer usage* were correlated in order to support findings for H2. Additionally, five sperate items about a direct comparison between traditional pen-and-paper homework and the *Cyber Homework* were presented. Lastly, the questionnaire asked for a general rating of the online learning platform, in which students could assign marks to the time before and

during the Covid-19 pandemic. This was combined with findings concerning frustration and thus relates to the examination of H3. A clear structure and design were employed in order not to overwhelm especially the younger students participating.

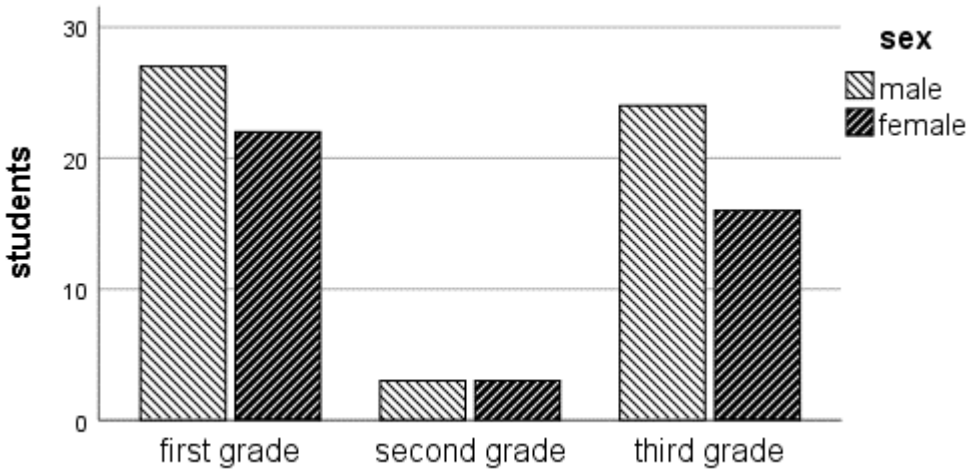
After the survey period, a data set with *N* = 95 was generated, which was then transferred into the programme SPSS and analysed further. During the phases of creation, publication and evaluation of the questionnaire, it was ensured to gather as little personal data of students as possible and process everything according to the data protection regulations *DSGVO*.

6. Findings

The results of the questionnaire are presented in order to answer the second research question and test for the previously described hypotheses. First, a validation of the claims voiced in the literature concerning organisational implications like instant feedback and multiple attempts will be brought forward. In a second step, the motivational aspects, including student attitude and motivational aspects will be demonstrated. Here, data to validate the hypotheses will be presented, with further noteworthy results.

A total number of 95 lower secondary students (*N* = 95) from two Viennese schools successfully participated in the study, with 49 pupils of first grade (27 male, 22 female), 6 pupils of second grade (3 male, 3 female) and 40 pupils of third grade (24 male and 16 female). The results show that in total more male students (*n* = 54; 56.8%) than female students (*n* = 41; 43.2%) participated in the survey (see Fig. 1).

Figure 2: Distribution of students according to grade and sex (*n* = 95)



The age of students examined ranged from ten to thirteen, with an average of 11.66 (*SD* = 1.14). Most students were either 11 (*n* = 34; 35.8%) or 13 years old (*n* = 34; 35.8%), 16 pupils were of age 10 (16.8%) and the smallest group consisted of 11 pupils (11.6%) that were 12 years old.

A slight majority of all students surveyed (53.7%) indicated that they possess their own computer, i.e. tower, notebook, laptop, excluding smartphone and tablet. It was possible to further divide students into two groups according to their age, due to the given comparability of the resulting participant number. The first group consisted of students ten and eleven years old (n_1 = 50), while twelve- and thirteen-year olds were categorised into group two (n_2 =45). This differentiation allowed for a closer investigation of computer ownership in connection with pupils' increasing age.

Figure 3: Students' ownership of a computer (*n* = 95)

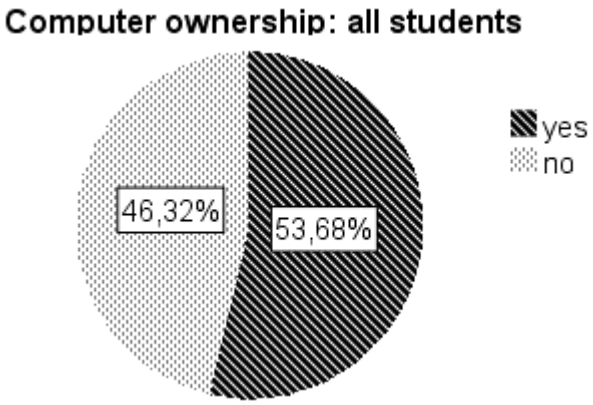


Figure 4 and 5: Students' ownership of a computer according to age group (*n* = 95)

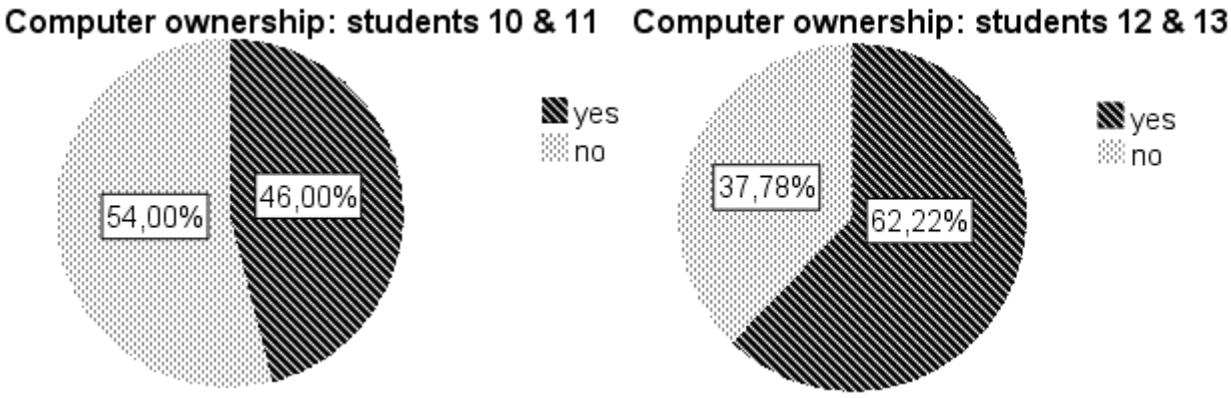


Figure 6 gives insight into students' computer usage of days per week, either for general purposes or for school related exercises and assignments. A further differentiation was made for the time before and during the Covid-19 pandemic. In both cases, the general, as well as the computer usage for school significantly increased. While the Covid-19 pandemic has a small effect on general computer usage, it shows a large effect size for school related computer usage (Cohen, 1988).

Figure 6: Computer usage before and during the Covid-19 pandemic (*n* = 95)

Variables	*M*	*SD*	*t* (94)	*p*	/*d*/
Computer Usage in general	4.24	2.56	-2.338	.022*	0.162
Computer Usage in general during Covid-19	4.68	2.84			
Comp. Usage for school in general	3.13	1.68	-21.883	<.001**	2.526
Comp. Usage for school during Covid-19	6.92	1.26			

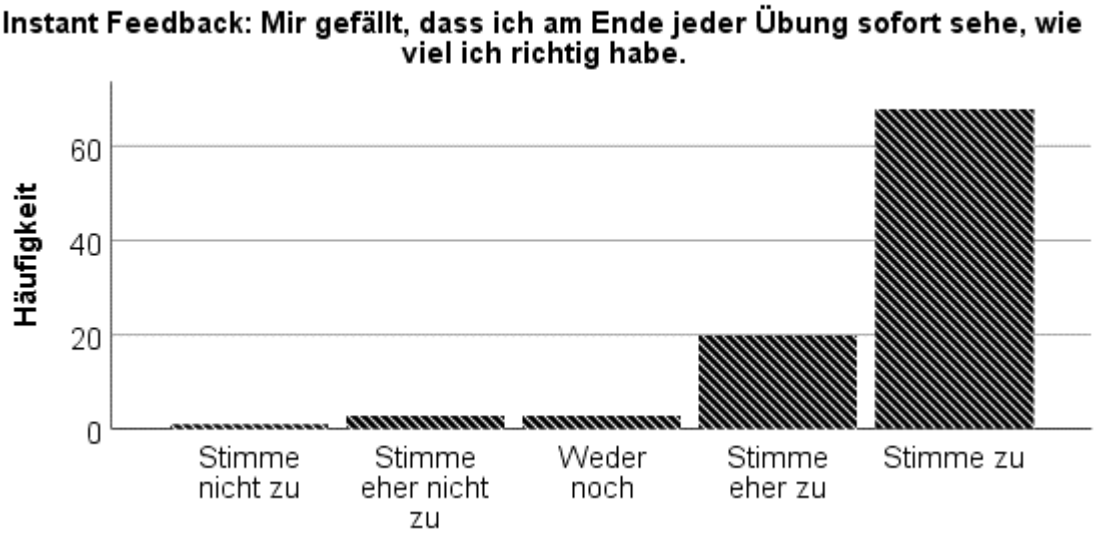
* p <.05; ** p <.01

This expected finding is most certainly connected to the Covid-19 pandemic and the distance learning phase. Still, it underlines the large impact of these circumstantial factors on students' computer use, especially for school related contexts.

6.1. Organisational Implications

Figure 7 presents the students' appreciation of the instant feedback that is automatically generated and provided after an exercise of the *Cyber Homework* has been completed. A vast majority of 88 students (92.7%) indicated that they are pleased by this, with 68 (71.6%) strongly agreeing to the statement.

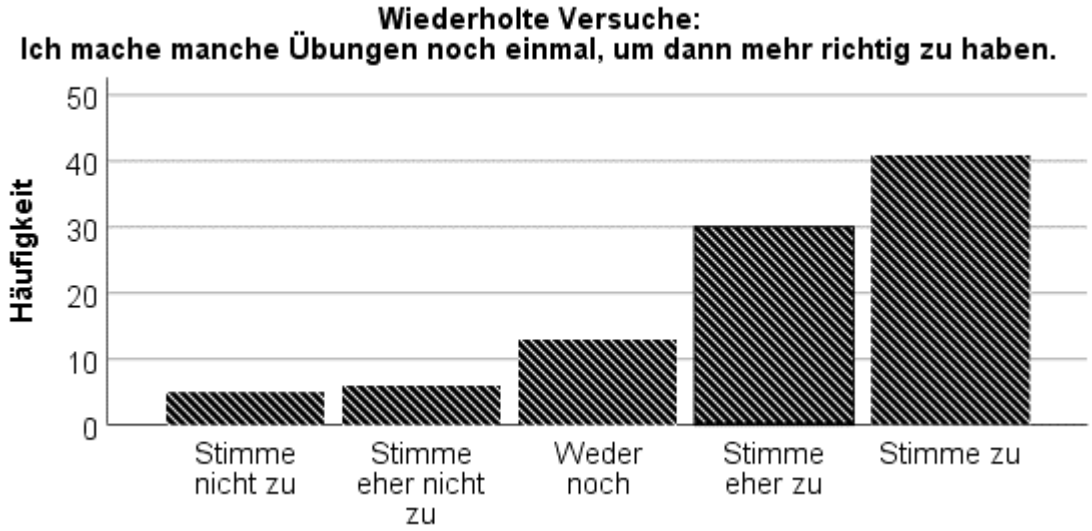
Figure 7: Instant feedback (*n* = 95)



Students also mark that they utilise multiple attempts to achieve a better result in the exercises of the *Cyber Homework*. As presented in figure 8, a total number of 71 pupils (74.8%) express their approval to this utterance, with 41 individuals (43.2%) in strong

agreement. 13 students (13.7%) are undecided and 6 (6.3%) do rather not agree, while 5 (5.3%) do not like this feature at all.

Figure 8: Multiple attempts (*n* = 95)



In regard to the utilisation of multiple attempts, it must be noted that this variable significantly correlates to the students' strive to achieve 100% in all tasks of the *Cyber Homework,* ($r = .437$, $p < .001$, $n = 95$). According to Cohen (1988) this resembles a medium effect size.

Students' estimate of time needed to complete one instance of *Cyber Homework* in comparison to homework of equal length in the *Workbook* (Gerngroß et al., 2016) were compared. It was not possible to identify an inclination towards either a decreased or an increased time investment ($M = 2.95$). Neither a differentiation according to sex nor age produced significant results in this matter.

6.2. Motivational Aspects and Student Attitudes towards Cyber Homework

In the following, motivational aspects, as well as attitudes of students towards the digital homework system, *Cyber Homework*, were investigated. For that purpose, the results for the entire population ($n = 95$), as well as for male ($n = 52$) and female students ($n = 41$) were analysed. As the questionnaire was specifically designed for the purpose of the thesis, Cronbach's alpha was included to show how well the items test for a variable.

Although a few items were based on constructions from already existing questionnaires, the majority has never been tested beforehand.

Figure 9: Means of variables in general (n = 95) and according to sex (n_{male} = 54; n_{female} = 41)

Variables	overall		male		female		α
	M	*SD*	*M*	*SD*	*M*	*SD*	
Motivation towards Cyber Homework	3.26	1.08	3.15	1.12	3.41	1.00	0.84
Motivation towards computer usage	4.34	0.68	4.27	0.74	4.44	0.59	0.51
Technical capacity to interact with *e-zone*	4.40	0.57	4.39	0.58	4.41	0.55	0.61
Facility of Cyber Homework tasks	3.63	0.80	3.59	0.84	3.67	0.76	0.53
Intrinsic motivation for Cyber Homework	3.46	1.19	3.25	1.25	3.74	1.05	0.86
Cyber Homework as support for learning	4.15	0.93	4.14	0.95	4.17	0.91	0.83
Strive to achieve 100% in all tasks	4.16	0.92	4.03	0.98	4.33	0.81	0.62
Frustration induced by technical problems	3.44	0.88	3.48	0.87	3.39	0.89	0.67

Only the variable *intrinsic motivation for Cyber Homework* produces a significant result concerning differences in sex ($t(93) = -2.045$, $p = .044$), with the mean of female students showing a greater value. According to Cohen (1988) the effect size is $d_{Cohen} = 0.424$, which relates to a medium effect size.

A classification of these variables in respect to grades might not necessarily depict age differences of students correctly, hence the choice has been made to directly test the variables for age instead. As mentioned before, participants are from ten to thirteen years old. A division into two comparable groups, namely pupils younger than twelve (n = 50) and pupils twelve and above (n = 45) is possible. Again, only the variable *intrinsic motivation for Cyber Homework* yields significant results ($t(93) = -2.275$, $p = .025$, $d_{Cohen} = -1.07$). According to Cohen (1988), this resembles a large effect size.

Figure 10: Means of variables according to two age groups ($n_{<12}$ = 50, $n_{>=12}$ = 45)

Variables	<12		>=12		*t* (93)	*p*	|*d*|
	M	*SD*	*M*	*SD*			
Motivation towards Cyber Homework	3.36	1.10	3.16	1.05	0.924	.358	n.s.
Motivation towards computer usage	4.26	0.72	4.44	0.61	1.268	.208	n.s.
Technical capacity to interact with *e-zone*	4.36	0.54	4.45	0.60	0.811	.419	n.s.
Facility of Cyber Homework tasks	3.70	0.84	3.54	0.76	0.943	.348	n.s.
Intrinsic motivation for Cyber Homework	3.72	1.16	3.18	1.16	-2.275	.025*	0.466
Cyber Homework as support for learning	4.20	0.89	4.10	0.97	-0.524	.621	n.s.
Strive to achieve 100% in all tasks	4.31	0.78	3.99	1.03	-1.721	.089	n.s.
Frustration induced by technical problems	3.48	0.85	3.39	0.91	-0.473	.637	n.s.

* p < .05; n.s. = not significant

Another area of interest is how the students' motivation to use and work with computers significantly affects both, their *motivation towards Cyber Homework*, as well as their *technical capacity to interact with the e-zone.* In Figure 11, the three variables were correlated which revealed that the variable *motivation towards computer usage* significantly correlates with both in medium effect size (Cohen, 1988). This can be translated into the claim that if students are more motivated towards using the computer, they are more likely to be motivated towards *Cyber Homework* and have increased capacities to navigate the e-zone platform. All depicted correlations are of medium effect size (Cohen, 1988).

Figure 11: Correlation motivation towards computer usage (*n* = 95)

Variables	(1)	(2)	(3)
	r	*r*	*r*
(1) Motivation towards computer usage		.307**	.389**
(2) Motivation towards Cyber Homework	.307**		.349**
(3) Technical capacity to interact with e-zone	.389**	.349**	

** p < .01

Simultaneously, it has been observed that the variables *technical capacity to interact with the e-zone* and *Facility of Cyber Homework tasks* significantly correlate (r = .468, p = <.001, n = 95). In other words, this means that when students exert higher technical capacity concerning the online learning platform, their experienced facility of *Cyber Homework* tasks is also increased and vice-versa.

As can be seen in Figure 12, there is a significant correlation between students' frustration and motivation towards *Cyber Homework*. When higher frustration is experienced, for example because of technical breakdowns or server problems, the pupil's motivation towards *Cyber Homework* decreases. According to Cohen (1988) this resembles a medium effect size. Furthermore, Figure 12 also investigates a correlation between the *availability of personal support* when faced with new tasks or problems at home to students' *motivation towards Cyber Homework* and *computer usage*. No significant correlations are observable in this context. In other words, *availability of personal support* neither has a significant relation to a pupil's *motivation for the utilisation of the Cyber Homework*, nor their *motivation to use the computer*.

Figure 12: Correlation of frustration and availability of personal support with motivation towards Cyber Homework and computer usage (*n* = 95)

Variables	Motivation towards Cyber Homework	Motivation towards computer usage
	r	*r*
Frustration	-.356**	.092
Availability of personal support	.005	.026

** p < .01

However, this examination did, indeed, shed a light on a significant correlation between the previously mentioned existence of *availability of personal support* concerning instruction of tasks, and the variable of *facility of Cyber Homework tasks* (*r* = -.249; *p* = .015; *n* = 95). This means that increased *availability of personal support* relates to students experiencing lesser *facility of Cyber Homework tasks.* According to Cohen (1988) this resembles a small effect size.

Data generated from utterances about a direct comparison of *Cyber Homework* to traditional homework in the *MORE! Workbook* (Gerngroß et al., 2016) is correlated to overall motivation towards *Cyber Homework* and yields significant results. The items are presented in English translation and shortened, for the original statements, please refer to the appendix. According to Cohen (1988), all items correlate with a medium effect, only the statement "I like *Cyber Homework* more than *Workbook* homework" correlates with a strong effect.

Figure 13: Spearman Correlation of comparing utterances for Cyber Homework to motivation towards Cyber Homework (*n* = 95)

Variables	Motivation towards Cyber Homework		
	n	*p*	*r*
I am better at CHW than in Workbook HW	95	.002**	.307
I like CHW more than Workbook HW	95	<.001**	.507
I need less time for CHW than Workbook HW	95	<.001**	.408
I learn more with CHW than with Workbook HW	95	.001**	.343

** p < .01; (C)HW = (Cyber) Homework

A further result allowed for a distinction of students that either are significantly more intrinsically or extrinsically motivated concerning the utilisation of the *Cyber Homework*. A differentiation in agreement towards intrinsic and extrinsic motivation made it possible to divide the population (*n* = 82) into two groups, while omitting those that were undecided (*n* =13). The majority of pupils (*n* = 53; 54.63%) was intrinsically motivated, while 29 pupils (35.37%) were predominantly extrinsically motivated. These populations do not distinguish between and thus consist of both, full agreement and partial agreement respectively. Thus, both have to be understood as *towards* intrinsic or extrinsic motivation.

Figure 14: Differentiation intrinsic and extrinsic motivation towards Cyber Homework (*n* = 82)

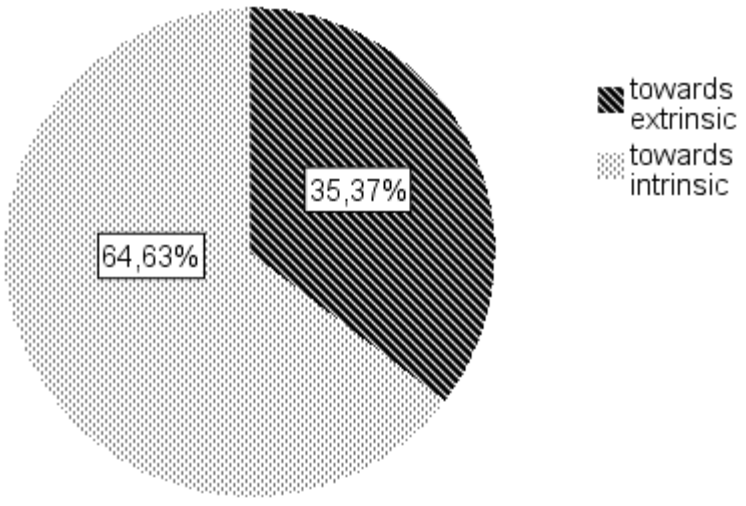


Figure 15 investigates whether there exists a difference between students that are more intrinsically or extrinsically motivated towards the utilisation of *Cyber Homework* and the

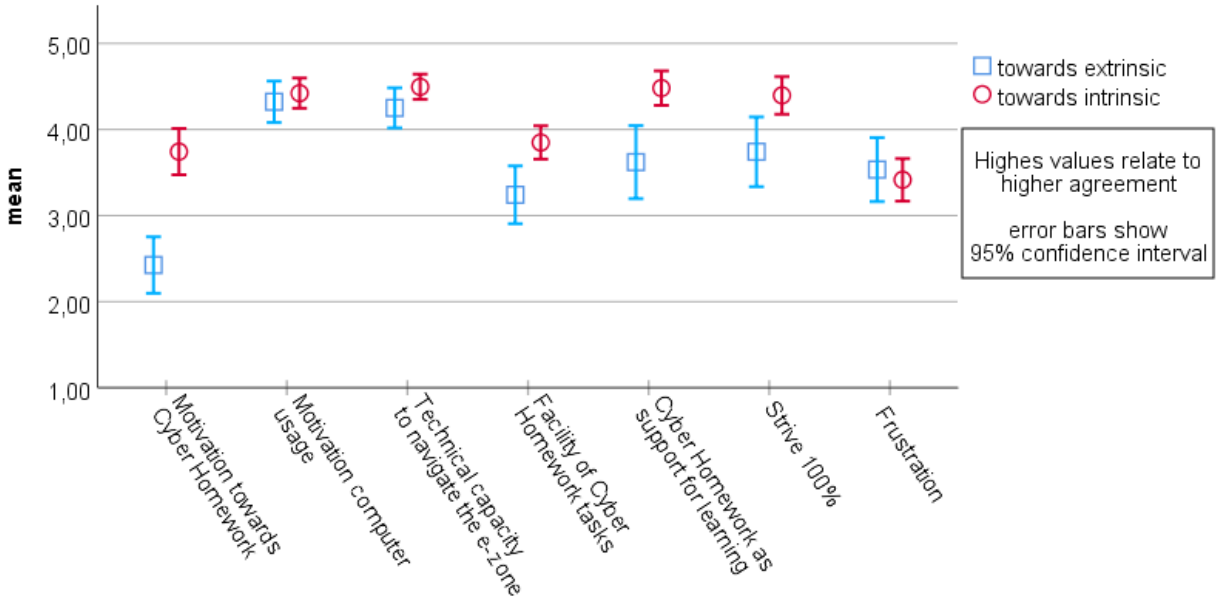
other variables investigated. Results show significantly higher values for students towards intrinsic motivation. Large effect sizes are identifiable with the variables *motivation towards Cyber Homework, facility of Cyber Homework tasks, Cyber Homework as support for learning* and *strive to achieve 100%* (Cohen, 1988).

Figure 15: Means of students towards intrinsic (*n* = 53) and extrinsic (*n* = 29) motivation

Variables	intrinsic m.		extrinsic m.		*t* (80)	*p*	|*d*|
	M	*SD*	*M*	*SD*			
Motivation towards Cyber Homework	3.74	0.96	2.43	0.86	-6.080	<.001**	1.404
Motivation towards computer usage	4.42	0.64	4.32	0.63	-0.678	.500	0.157
Technical capacity to interact w. *e-zone*	4.50	0.53	4.25	0.61	-1.893	.062*	0.437
Facility of Cyber Homework tasks	3.85	0.70	3.24	0.88	-3.411	.001**	0.788
Cyber Homework as support for learning	4.48	0.73	3.62	1.12	-3.742	.001**	0.864
Strive to achieve 100% in all tasks	4.40	0.79	3.74	1.07	-2.899	.006**	0.670
Frustration induced by technical prob.	3.42	0.90	3.53	0.98	0.558	.579	0.129

* p <.05; ** p < .01

Figure 16: Error bars as illustration for means of students towards intrinsic (*n* = 53) and extrinsic (*n* = 29) motivation



As presented in Figures 17 and 18, students give the *Cyber Homework* a worse grade during the Covid-19 pandemic than in retrospect to the time before. For this purpose, students were asked to assign a grade, ranging from the best 1 ("Sehr gut") to the worst 5 ("Nicht

genügend"). Although the median for both evaluations is the same (*median* = 2), the two Figures (17 and 18) show an uneven distribution (Wilcoxon-test: *z* = -2.860, *p* = .004, *n* = 95). According to Cohen (1988) this effect is r = .29, which almost resembles a medium effect size.

Figure 17: Grade given to the Cyber Homework by students in general (*n* = 95)

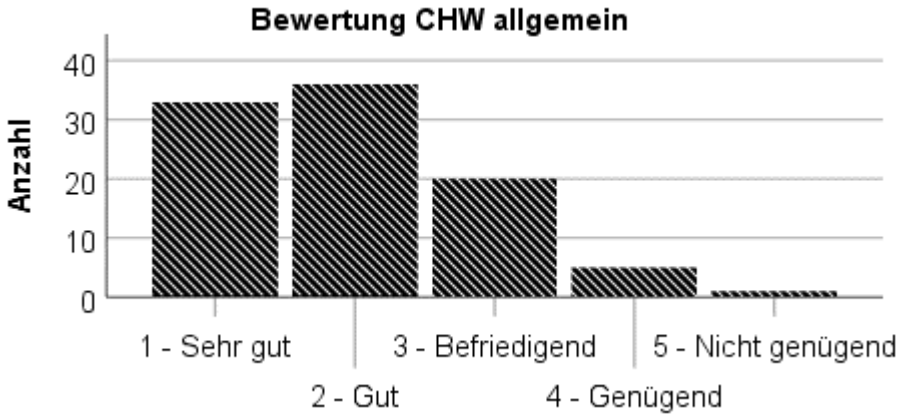
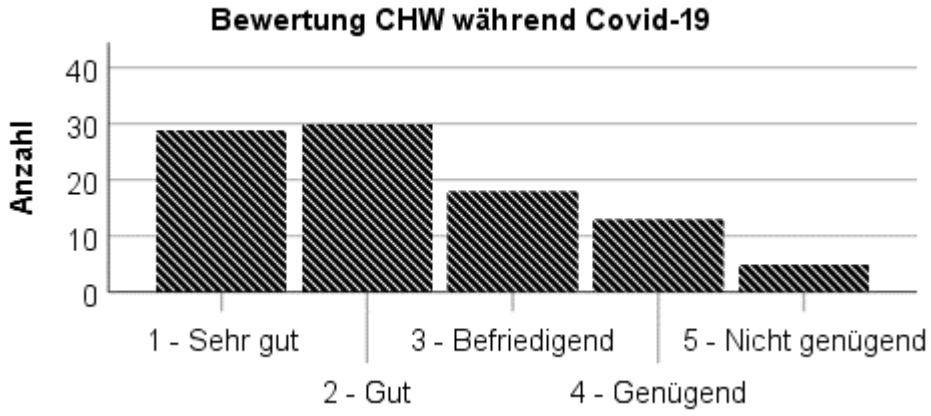


Figure 18: Grade given to the Cyber Homework by students during Covid-19 (*n* = 95)



The next Figure focuses on a possible correlation between the just investigated grades and the variable of *frustration*. It shows that both types of grades have a significant correlation to it, with the correlation to the *grade during Covid-19* resembling a large effect size (Cohen, 1988).

Figure 19: Spearman Correlation between grade in general, grade during Covid-19 and frustration (*n* = 95)

	Grade in general		Grade during Covid-19	
	p	*r*	*p*	*r*
Frustration	.003**	.298	<.001**	.533

** p < .01;

A greater experience of frustration leads to an increase of the grade given by students, which resembles a worse evaluation. The results of the correlation show that the variable of *frustration* more strongly correlates to the *grade given during Covid-19*, which translates to a more distinct connection between an assumed increase in frustration and the correspondingly worse grade.

7. Discussion

After the extensive description of the empirical study and results obtained, the conclusions and implications of the topic of investigation will now be presented and discussed. The empirical investigation builds upon the knowledge generated via the analysis of *MORE! Cyber Homework* regarding its usefulness towards current demands for digital competencies voiced in the Austrian curriculum. The findings support and enhance the deliberations made in response to the first research question with empirically compiled data of two Viennese schools. Chapter 3.3., carefully demonstrated that although the *e-zone* is indeed a feasible means of practicing a number of the postulated digital competencies of *Basic Digital Education*, it most certainly does not and cannot cover all of them. Due to difficulty of verification, this insight could only be partially integrated into the empirical study. What was possible was an integration into students' self-assessment concerning aspects of relevant competencies. For that purpose, students' inclination to work with computers and their capabilities in regard to the utilisation of the peripherals that are necessary for the *Cyber Homework* were investigated. A remarkably high outcome (M = 4.40) was generated, which has to be understood on a scale of one to five, with the latter resembling high agreement. Students stated that they like working with the computer (M = 4.23) and feel capable in regard to the use of the keyboard (M = 4.15), also in relation to special characters and symbols specific to the English language (M = 4.65). It has to be noted that variations because of pupils' sex could not be detected and age-related differences were only marginal in this context.

Active utilisation of digital media is a concern in the mediation of digital competencies (Andrei, 2017; European Institute for Gender Equality, 2018; Ulbing, 2013). Although it is not the sole influencing factor, students' ownership of a computer, i.e. tower, laptop or notebook, most certainly contributes to their access to digital media. The results generated give more insight into the state of availability of computers for individual students at home. Slightly more than half of the students asked indicated that they had at least one of the aforementioned devices of their own. A closer examination of ownership (see Fig. 3 and 4) revealed a lower percentage for students aged eleven and twelve, while the portion of slightly older students, aged twelve and thirteen, was higher.

Further insights about another objective of the curriculum, which relate to students' versatile use of digital media were obtained. This exploration was strongly connected to the Covid-19 pandemic and its effects on teaching and distance learning. In that time students were taught remotely at home via digital media, in the form of online assignments, work plans, videoconferences and online learning platforms, like the *e-zone*. Naturally, this impacted on workload, which mainly had to be carried out on the computer and affected both, general and school-related usage thereof. The latter was especially affected (d_{Cohen} = 2.526) with students indicating that they spent almost seven days per week in front of a computer to work on the tasks given by teachers or for other school related reasons.

The main focus of the empirical investigation is expressed in the second research question:

Does the utilisation of *MORE! Cyber Homework* exhibit desirable outcomes in regard to organisational costs and benefits, as well as motivational effects for the students surveyed?

The first aspect thereof relates to organisational benefits and drawbacks described in chapter 4.2.2., which are only achievable via a digital learning platform. In H1 it was hypothesised that these are indeed verifiable and simultaneously well received by students, regardless of sex or age. Here, the most prominent advantage is expressed in automatically generated feedback that is immediately provided to the student after an exercise has been finished. The results thoroughly support this statement, with a vast majority of pupils (92.7%) appreciating its existence and finding joy in observing how many tasks they had done correctly. Students show a similar attitude towards the availability of multiple attempts and 74.8% of them agree that they actively utilise this feature. Furthermore, a correlation (r = .437) between students who employ multiple attempts and those who want to achieve 100% in all task of the Cyber Homework can be detected. As the majority of students indicated that they aspire towards a full completion of tasks (M = 4.16), allowing for multiple attempts can be regarded as catering to this acquisition. Consequently, it can be deduced that both features, instant feedback and multiple attempts, are well received by students and should therefore be made use of when

working with *MORE! Cyber Homework*. This is especially relevant as the two elements might be deactivated by default when first configuring the *e-zone* platform.

Anther claim voiced about an online homework system is concerned to an increase of time investment for students when working with a new online homework platform. As reported in a comparison between time necessary for digital and pen-and-paper homework, this assumption could not be supported, either in a global, or in an age-specific perspective. This could be connected to the previously described phenomenon of intuitiveness (Ferrari, 2012), which potentially is identifiable on the *e-zone* platform. Results could indicate that the present online homework system only requires a minimal time investment from students in order to get to know the constituents and features of the website. Furthermore, it can be deduced that due to the employment of easily identifiably features, like intelligible buttons for navigation, and a clear structure, students are able to quickly grasp how to interact with this online homework platform. This is in line with deliberations made about the rapid adaptability of young people (Lunsford & Pendergrass, 2016) and shows a connection with aspects of the concept of computational thinking (Shute et al., 2017) as mentioned in the Austrian curriculum (Federal Ministry Republic of Austria - Education Science and Research, 2018).

When investigating the second hypothesis (H2), it becomes clear that the positive outcomes for students' motivational aspects and attitudes are only to a certain degree evident when working with *Cyber Homework*. It possible to identify moderately high agreement of pupils towards the motivational effects of the online homework platform (M = 3.26), with marginally better outcomes for female students (M = 3.41) and younger students (M = 3.36). In order to better comprehend this disappointing outcome, other findings about students' contact with *e-zone* must be mentioned. An auxiliary result can be generated concerning students' motivation to work with computers, which rated higher (M = 4.34). In this context, no differences concerning sex can be made and older students are only little more motivated to use the computer. Still a significant correlation (r = .307) between the two variables can be identified (see Figure 11). This means that if students' motivation to work with computers is higher, they also experience more motivation towards *Cyber Homework*. Likewise, a significant correlation to technical capabilities of

pupils concerning the interaction with the e-zone can be detected (*r* = .349). Both, motivation to work with computers, as well as technical capabilities for interacting with the platform show higher levels of agreement, and significantly correlate to students' motivation towards Cyber Homework. Hence, a conclusion can be reached about the first hypothesis which acknowledges the only moderately high motivational benefits of this platform. The two other variables show that students neither lack motivation to work with computers in general, nor lack knowledge of how to successfully interact the learning platform. Thus, *MORE! Cyber Homework* is evidently not highly motivating for students, because motivational gains are only identifiable at a fair level.

These findings are especially striking as a comparison between the *Cyber Homework* and the "traditional" pen-and-paper homework in the *Workbook* (Gerngroß et al., 2016) reveals highly significant correlations to the students' motivation towards *Cyber Homework*. For example, pupils who believe that they are better with the digital homework will also experience higher motivation when working with the e-zone (*r* = .307). Almost identical results can be observed for students that subjectively like the *Cyber Homework* better (*r* = .507), need less time for the online tasks (*r* = .408) and believe that they learn more than with traditional homework in the schoolbook (*r* = .343). Although these correlations of medium and high effect size could positively influence the motivational effects of *Cyber Homework*, this outcome fails to show. The reason for this is the fact that students are undecisive in their agreement throughout to the aforementioned comparisons (Figure 13).

A further reason for the medium-sized result of motivational benefits of the *Cyber Homework* could be related to the phenomenon of frustration. It mainly occurs when technical problems take place on the learning platform, for example in the form of connectivity related issues or the fact that progress is not saved properly. Students agree that these difficulties exist when working with *Cyber Homework* and acknowledge their impact on frustration (*M* = 3.44). It is interesting to see that the identical findings are evident with both sexes, as well as with younger and older students. These findings are underlined by a negative correlation between the two variables (*r* = -.356). That is to say that pupils who experience higher levels of frustration when working with the *e-zone* will,

simultaneously, be less motivated towards the learning platform. This discovery has to be kept in mind for the final discussion H3 which relates to students' assessment of Cyber Homework, before and during Covid-19.

A supplementary analysis made it possible to divide the population of test subjects according those that are more intrinsically and extrinsically motivated. Figure 14 shows that the majority, 53 of 82 students (64.63%), are indeed more intrinsically motivated. This finding builds on a significant difference between both, male (*M* = 3.25) and female (*M* = 3.74) students, as well as younger (*M* = 3.72) and older (*M* = 3.18) students. Female pupils and those under twelve are statistically more likely to be intrinsically motivated to do the *Cyber Homework*. It is fascinating to observe that this classification develops several significant results concerning the previously discussed variables. The most striking outcome evident in Figure 15 concerns students' motivation towards *Cyber Homework*, in which intrinsic motivation generates a significantly higher value (*M* = 3.74) than extrinsic motivation (*M* = 2.43). This allows for a valuable insight for teachers, as more extrinsically motivated students have considerably more negative attitudes towards working with the *e-zone*. The finding could be put into perspective with the phenomenon of the overjustification effect (Deci & Ryan, 1985), which describes the possibility of external rewards undermining intrinsic motivation. Naturally, this is a delicate matter, as extrinsic factors are inherent to homework in general and obviously to online homework systems as well. However, in chapter 4.2.2.2. it has been established that students are less likely to participate in either of the two homework systems, if their efforts do not contribute to their grade. It is therefore highly questionable whether declaring the *Cyber Homework* as voluntary is a solution to this problem. Still, it must be mentioned that almost all school related tasks and assignments are likewise assessed and therefore face a similar issue.

Moreover, students with higher intrinsic motivation have considerably more positive outcomes concerning their perceived facility of *Cyber Homework* tasks ($|d_{Cohen}| = 0.788$), their judgment of the platform as supporting their learning ($|d_{Cohen}| = 0.864$), as well as their strive to achieve 100% in all tasks ($|d_{Cohen}| = 0.670$). It can be observed that only pupils' motivation towards computer usage and frustration induced by technical problems do not yield significant results in this differentiation. Although not significant, the latter is

the only instance in which the extrinsically motivated students achieve a higher result. This can cautiously be translated into a circumstance of intrinsically motivated students as potentially being not as susceptible to frustration than the contrasting group.

The examination of H3 deals with a potential influence of the Covid-19 pandemic and connected outages of the *e-zone* on students' retrospective perception of the learning platform. For that purpose, pupils were instructed to rate the *Cyber Homework* according to the commonly utilised system of school grades for Austria (1 - "Sehr gut" [very good] to 5 - "Nicht genügend" [fail]). Via two phases, one each for the time before and during the Covid-19 pandemic, respective differences are observed in the results. Although these are very similar (see Fig. 17 and 18), it is possible to detect slight variations, with a higher assessment for the latter timespan, which resembles a worse outcome. Furthermore, a correlation between the two grades and the variable of frustration reveals the existence of a close connection (Figure 19). If students experience increased levels of frustration, they are likely to give the *Cyber Homework* a worse grade.

In this context, it must be mentioned that this correlation is noticeably stronger during the Covid-19 pandemic (r = .533). It can therefore be deduced that during this time, frustration had a stronger effect on the students' retrospective assessment. This can be due to the fact, that the phenomenon of frustration has only gained elevated importance during the pandemic, because many students had to access to online platform simultaneously. As the phase of home schooling and distance learning continued for a longer period of time, many students reported that they came into contact with these outages and technical difficulties. Deci and Ryan (1985) mention the emergence of anger and upset, if issues like these continue to exist. These described factors are likely to contribute to the increased correlation between frustration and the given grade for the time during the Covid-19 pandemic. This finding links back to the discussion of H1 in which students who experience high levels of frustration with *Cyber Homework* due the technical problems, the motivational aspects of the platform as less distinctive. This is underlined by the fact that the motivation towards *Cyber Homework* in correlation to motivation of working with computers (r = .307) does not show outcomes as distinct as the correlation to frustration (r = -.356). As mentioned in the theoretical framework, it can be deduced that frustration

is indeed undermining the motivational benefits that accompany the utilisation of an online homework platform, especially when dealing with problems that are not caused or resolvable by the individual. Hence, it is important to remember advice given by Lunsford and Pendergrass (2016) about the necessity of flexibility by the teacher if these issues occur. As mentioned before, the first step to counteract this circumstance is to extend due dates and thus accommodate the students' problem.

Concluding remarks and resulting implications for the utilisation of the *MORE! Cyber Homework* in the teaching of English are presented in the following chapter.

8. Conclusion

The aim of this master's thesis was to investigate the usefulness of *MORE! Cyber Homework* in relation to *Basic Digital Education* in Austria. For that purpose, a closer look at recent developments and factors involved in the teaching of digital competencies was taken. It could be established that the online homework platform *e-zone* can indeed be regarded as supporting a limited number of the relevant competencies concerning digital media. The research project presented an empirical investigation of students' evaluations of *Cyber Homework* in a quantitative approach with 95 participants of lower secondary education from two Viennese schools. The findings support the view that *MORE! Cyber Homework* fosters important competencies mentioned in the curriculum, with students' agreement and attitudes towards them.

The main objective of the empirical investigation was to verify the positive effects that are put forward in the literature regarding the utilisation of an online homework system with students. In this context, organisational implications, as well as motivational aspects and students' attitudes towards *Cyber Homework* were investigated. It could be shown that organisational aspects were indeed identifiable and appreciated by students throughout. Here, it must be noted that automatically generated feedback, as well as multiple attempts were highly favoured by pupils and therefore should be enabled to achieve the most beneficial outcomes. In addition, the results revealed that although present, the overall motivational benefit for the *Cyber Homework* was not extraordinarily high. However,

students' affinity for computer usage, as well as their necessary technical capabilities for the interaction with the platform could be detected thoroughly. This poses the question of why students do not seem to be as fond of this instance of an online homework platform as was argued in several sources, e.g. Altun (2008) and Lunsford and Pendergrass (2016). A possible explanation for this finding might be related to the concept of frustration, which can be experienced by students when technical problems occur. In the analysis of data, a connection between frustration and the overall motivation towards *Cyber Homework* could be identified. It translates to frustration potentially reducing the motivational effects of the digital homework. This insight must be underlined, as it gained more relevance during the time of the Covid-19 pandemic, in which the empirical investigation took place. Due to several technical outages and connectivity issues, students increasingly reported occurrences of these problems, which might subsequently have caused feelings of frustration. This is also supported in the students' final assessment of the *Cyber Homework*, in which the grade for the period of the pandemic is significantly worse. In this context it was possible to identify the influence of frustration on their retrospective evaluation.

The results also show a difference in students who are partially intrinsically motivated. Younger, as well as female students are more likely to experience intrinsic motivation towards the utilisation of the *Cyber Homework*. Among others, significantly higher outcomes could be observed concerning experienced facility of *Cyber Homework* tasks, as well as the description of the online learning platform as support for learning.

In summary, it can be stated that *MORE! Cyber Homework* is a valuable addition to this commonly utilised schoolbook in Austria. Certain aspects of digital competence, as postulated by the curriculum for *Basic Digital Education* are covered and organisational effects are beneficial. Still, the empirical investigation has shown that students are only partly motivated when working with the e-zone. However, these findings have to be understood in the context of the Covid-19 pandemic and its connected distance learning as well as the increased possibility of students experiencing frustration. Additionally, the results also only represent data from a specific number of students of two Viennese schools. Due to the exceptional circumstances and composition of the sample,

generalisation of results is limited. Still, valuable insights about the homework platform, its features and the students' attitude and opinion about them could be made. This is why English teachers that utilise the *MORE!* series should, if they have not done so, consider the *Cyber Homework* as a useful extension of their classes, which simultaneously contributes to acquisition of relevant digital competencies.

Further research could bring more insight about attitudes and engagement with *MORE! Cyber Homework* in future times. It would be interesting to see how results change students of upper secondary and when distance learning is continued for a longer period of time and all school related assignments and task have to be carried out on the computer. As *Cyber Homework* is only one instance of an online homework system, it is compelling to investigate how other systems, maybe even from a different school subject, are structured and perceived by students.

9. Bibliography

Abrams, S. S., & Walsh, S. (2014). Gamified Vocabulary. *Journal of Adolescent & Adult Literacy, 58*(1), 49–58.

Adolphs, S., Clark, L., Dörnyei, Z., Glover, T., Henry, A., Muir, C., et al. (2018). Digital innovations in L2 motivation: Harnessing the power of the Ideal L2 Self. *System, 78*, 173–185.

Albelbisi, N. A., & Yusop, F. D. (2018). Secondary School Students' Use of and Attitudes toward Online Mathematics Homework. *The Turkish Online Journal of Educational Technology, 17*(1), 144–153.

Altun, E. (2008). 6TH, 7TH AND 8TH GRADERS' ATTITUDES TOWARDS ONLINE HOMEWORK ASSIGNMENT SITES. *The Turkish Online Journal of Educational Technology, 7*(4), 5–18.

Amiryousefi, M. (2016). Homework Voices from EFL Teachers and Learners. *Iranian Journal of Language Teaching Research, 4*(2), 35–54.

Andrei, E. (2017). Technology in Teaching English Language Learners: The Case of Three Middle School Teachers. *TESOL Journal, 8*(2), 409–431.

Arikan, Y. D., & Altun, E. (2007). A research on preschool and primary student-teachers' use of online homework sites. *Elementary Education Online, 6*(3), 366–376.

Aroroa, M. L., Rho, Y. J., & Masson, C. (2013). Longitudinal Study of Online Statics Homework as a Method to Improve Learning. *Journal of STEM Education, 14*(1).

Bakla, A. (2019). A Study of Digital Nativeness and Digital Productivity: Data from EFL and ESL Contexts. *Malaysian Online Journal of Educational Technology, 7*(1), 15–33.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Barberi, A., Swertz, C., & Zuliani, B. (2018). "Schule 4.0" und medialer Habitus. *Medienimpulse, 56*(2), 1–20.

BMBWF (2018). *Information betreffend Einführung der Verbindlichen Übung "Digitale Grundbildung" in der Sekundarstufe 1 im Schuljahr 2018/19.* Wien: BMBWF Bundesministerium für Bildung, Wissenschaft und Forschung, from https://www.bmbwf.gv.at/dam/jcr:5179917e-3463-4079-a252-810a04ce2a65/vue_dgb_info.pdf.

Bodnar, S., Cucchiarini, C., Strik, H., & van Hout, R. (2016). Evaluating the motivational impact of CALL systems: current practices and future directions. *Computer Assisted Language Learning, 29*(1), 186–212.

Bonham, S., Beichner, R., & Deardorff, D. (2001). Online homework: Does it make a difference? *The Physics Teacher, 39*(5), 293–296.

Boo, Z., Dörnyei, Z., & Ryan, S. (2015). L2 motivation research 2005–2014: Understanding a publication surge and a changing landscape. *System, 55*, 145–157.

Bowman, C. R., Gulacar, O., & King, D. B. (2014). PREDICTING STUDENT SUCCESS VIA ONLINE HOMEWORK USAGE. *Journal of Learning Design, 7*(2), 47–61.

Brandhofer, G. (2014). A subject „Media Literacy and Computer Sciences" – a necessary and sufficient condition for digital competencies? *Open Online Journal for Research and Education*. (1).

Brandhofer, G., Baumgartner, P., Ebner, M., Köberer, N., Trültzsch-Wijnen, C., & Wiesner, C. (2019). Bildung im Zeitalter der Digitalisierung. In S. Breit, F. Eder, K. Krainer, C. Schreiner, A. Seel, & C. Spiel (Eds.), *Nationaler Bildungsbericht Österreich 2018. Fokussierte Analysen und Zukunftsperspektiven für das Bildungswesen. Band 2* (pp. 307–362). Graz: Leykam.

Brandhofer, G., Kohl, A., Miglbauer, M., & Nárosy, T. (2016). digi.kompP – Digitale Kompetenzen für Lehrende: Das digi.kompP-Modell im internationalen Vergleich und in der Praxis der österreichischen Pädagoginnen- und Pädagogenbildung. *Open Online Journal for Research and Education*. (6).

Brandtzæg, P. B. (2016). The Social Media Natives: The Relationship between Young Peoples' Media User Type and Their Media Use at School. In E. Elstad (Ed.), *Digital Expectations and Experiences in Education* (pp. 149–162). Rotterdam: Sense Publishers.

Bundes- und Koordinationszentrum eEducation Austria (2016). *digi.check: Warum digi.check?* Retrieved February 05, 2020, from https://digicheck.at/index.php?id=561&L=0.

Bundesministerium für Bildung (2017a). *Wir sind Schule 4.0.* Retrieved February 13, 2020, from https://eeducation.at/fileadmin/downloads/Folien_17-11-24_eEducationFachtagung.pdf.

Bundesministerium für Bildung (2017b). *Bildungsministerium präsentiert Digitalisierungsstrategie „Schule 4.0": Umsetzung startet mit dem Schuljahr 2017/18 [Press release].* Retrieved January 29, 2020, from https://www.ots.at/presseaussendung/OTS_20170123_OTS0045/bildungsministerium-praesentiert-digitalisierungsstrategie-schule-40.

Bundesministerium für Bildung, Wissenschaft und Forschung (2020a). *EDUTHEK: Willkommen auf Eduthek.at für Schülerinnen und Schüler und deren Eltern/Erziehungsberechtigten und Lehrkräfte,* from https://eduthek.at/schulmaterialien.

Bundesministerium für Bildung, Wissenschaft und Forschung (2020b). *digi.check: Primarstufe.* Retrieved March 02, 2020, from https://digicheck.at/index.php?id=560&L=0.

Bundesministerium für Bildung, Wissenschaft und Forschung (2020c). *digi.check: Sekundarstufe I.* Retrieved March 02, 2020, from https://digicheck.at/index.php?id=562&L=0.

Bundesministerium für Bildung, Wissenschaft und Forschung (2020d). *digi.komp12 - Das Kompetenzmodell.* Retrieved March 02, 2020, from https://digikomp.at/?id=585.

Burch, K. J., & Kuo, Y.-J. (2010). TRADITIONAL VS. ONLINE HOMEWORK IN COLLEGE ALGEBRA. *Mathematics & Computer Education, 44*(1), 53–63.

Busch, M. (1993). Using Likert Scales in L2 Research. A Researcher Comments. *TESOL Quarterly, 27*(4), 733–736.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences.* New York: Academic Press.

Csikszentmihalyi, M. (1985). *Beyond boredom and anxiety.* San Francisco: Jossey-Bass Publishers.

Dalton-Puffer, C., Boeckmann, K.-B., & Hinger, B. (2019). Research in language teaching and learning in Austria (2011–2017). *Language Teaching, 52*(02), 201–230.

Deci, E. L., & Ryan, R. M. (Eds.) (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Springer Science & Business Media.

Dodson, J. R. (2014). The Impact of Online Homework on Class Productivity. *Science Education International, 25*(4), 354–371.

Doorn, D. J., Janssen, S., & O'Brien, M. (2010). Student Attitudes and Approaches to Online Homework. *International Journal for the Scholarship of Teaching and Learning, 4*(1).

Dorfinger, J. (2019). How to pimp up digital learning: Eine Wirksamkeitsstudie zum verstärkten Einsatz von Microsoft-Tools im Regelunterricht. *Online Journal for Research and Education*. (12).

Döring, N., & Bortz, J. (2016). *Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften.* Berlin Heidelberg: Springer.

Dörnyei, Z. (2007). *Research methods in applied linguistics: Quantitative, qualitative, and mixed methodologies. Oxford applied linguistics.* Oxford: Oxford University Press.

Dörnyei, Z., & Ushioda, E. (2011). *Teaching and researching motivation* (2nd ed.). *Applied linguistics in action.* Harlow England, New York: Longman/Pearson.

Egger, G. (2018). Digitale Grundbildung und Mathematik: Ergänzung, Unterstützung oder Konkurrenz. *Open Online Journal for Research and Education*. (Sonderausgabe 11: Tag der Mathematik 2018 – Wer Mathe lernt, hat mehr Erfolg im Leben!).

Ehlers, J. P., Guetl, C., Höntzsch, S., Usener, C. A., & Gruttmann, S. (2013). Prüfen mit Computer und Internet: Didaktik, Methodik und Organisation von E-Assessment. In M. Ebner & S. Schön (Eds.), *Lehrbuch für Lernen und Lehren mit Technologien* (2nd ed.). Berlin: epubli.

Eichmann, H., Schönauer, A., & Schörpf, P. (2019). *Soziale Risiken von Digitalisierungsprozessen: Trendanalysen im Erwerbs- und Privatleben mit Fokus auf Wien.*

Eisenmann, M. (2019). *Teaching English: Differentiation and individualisation. utb-studi-e-book*.

Elstad, E. (2016). Social Networking Sites, Social Media, and Internet: Challenging Issues for Schools. In E. Elstad (Ed.), *Digital Expectations and Experiences in Education* (pp. 139–148). Rotterdam: Sense Publishers.

European Institute for Gender Equality (2018). *Gender equality and youth: opportunities and risks of digitalisation.* Luxembourg: Publications Office of the European Union.

European Union (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning: OJ L 394. *Official Journal of the European Union*. 10–18.

Federal Ministry Republic of Austria - Education Science and Research (n.d.a). *Digital education: Master plan for digitalisation of education.* Retrieved February 09, 2020, from https://www.bmbwf.gv.at/en/Topics/school/krp/dig_edu.html.

Federal Ministry Republic of Austria - Education Science and Research (n.d.b). *Pädagog/innenbildung: Digital kompetente Pädagoge/innen: digi.kompP*. Kompetenzmodell für digital kompetente Pädagoginnen und Pädagogen. Retrieved January 29, 2020, from https://www.bmbwf.gv.at/Themen/schule/zrp/dibi/paed.html#01quelle.

Federal Ministry Republic of Austria - Education Science and Research (2018). Bundesgesetzblatt für die Republik Österreich: Teil II. 71. Verordnung des Bundesministers für Bildung, Wissenschaft und Forschung, mit der die Verordnung über die Lehrpläne der Neuen Mittelschulen sowie die Verordnung über die Lehrpläne der allgemeinbildenden höheren Schulen geändert werden: BGBl. II Nr. 71/2018.

Ferrari, A. (2012). *Digital competence in practice: An analysis of frameworks.* Luxembourg: Publications Office of the European Union.

Ferrari, A. (2013). *DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe.* Luxembourg: Publications Office of the European Union.

Fischer, H., Heise, L., Heinz, M., Moebius, K., & Koehler, T. (2015). How to identify e-learning trends in academic teaching. *Interactive Technology and Smart Education, 12*(1), 31–43.

Gerngroß, G., Puchta, H., Holzmann, C., Stranks, J., & Lewis-Jones, P. (2016). *MORE!: Student's book 1.* Innsbruck: Helbling Languages.

Groißböck, P. (2019). Fortbildung gern, aber zu Medienpädagogik?: Bestandsaufnahme und Ausblick zu Fort- und Weiterbildungsaktivitäten von Lehrenden an Volksschulen im Bereich Medienpädagogik. *Online Journal for Research and Education*. (11).

Helbling Verlag (n.d.). *MORE! Digitale Grundbildung: Kernstoff.* Innsbruck, from https://www.helbling.at/?pagename=digitale-grundbildung.

Helbling Verlag (2020a). *Lehrplan: Digitale Grundbildung.* Retrieved March 05, 2020, from https://www.helbling.at/?pagename=digitale-grundbildung.

Helbling Verlag (2020b). *HELBLING e-zone - die Lernplattform: Digitale Inhalte zu den erfolgreichen Lehr- und Lernmedien von HELBLING.* Retrieved March 09, 2020, from https://www.helbling-ezone.com/.

Helbling Verlag (2020c). *Mit der Helbling e-zone ist Lehren und Lernen noch einfacher: Was Sie als LehrerIn von der Helbling e-zone erwarten können.* Retrieved March 09, 2020, from https://www.helbling-ezone.com/?page=e-zone-for-teachers.

Himpsl-Gutermann, K., Brandhofer, G., Frick, K., Fikisz, W., Steiner, M., Bachinger, A., et al. (2018). *Abschlussbericht im Projekt: "Denken lernen - Probleme lösen (DLPL) Primarstufe".* Wien: Bundesministerium für Bildung, Wissenschaft und Forschung (BMBWF). Retrieved February 09, 2020, from https://www.bmbwf.gv.at/dam/jcr:64bda2b1-f31b-4184-be8f-705b44f9642e/dlpl_primarstufe_abschlussbericht.pdf.

Honegger, B. D. (2017). *Mehr als 0 und 1: Schule in einer digitalisierten Welt* (2., durchgesehene Auflage). Bern: hep der Bildungsverlag.

Hutchison, D., Kanade, T., Kittler, J., Kleinberg, J. M., Mattern, F., Mitchell, J. C., et al. (2012). *21st Century Learning for 21st Century Skills.* Berlin, Heidelberg: Springer Berlin Heidelberg.

Ilomäki, L., Kantosalo, A., & Lakkala, M. (2011). *What is digital competence?* (Linked portal).

Johnston, T. (2002). ONLINE HOMEWORK ASSESSMENTS BENEFITS AND DRAWBACKS TO STUDENTS. *Proceedings of the Academy of Educational Leadership, 7*(1), 39.

Joyce, P. (2018). The Effectiveness of Online and Paper-Based formative assessment in the learning of English as a second language. *PASAA, 55*.

Keefe-Cooperman, K. (2018). Training Teachers in Digital Literacy: Children as Digital Natives: Implications for Visual Spatial Functioning Skills and Teacher Preparedness. *Open Online Journal for Research and Education*. (Special Issue #12).

Kortemeyer, G. (2015). An empirical study of the effect of granting multiple tries for online homework. *American Journal of Physics, 83*(7), 646–653.

Kraker, N. (2017). Innovationen in der Weiterbildung von Lehrkräften durch Digitalisierung: Umsetzung an der Pädagogischen Hochschule Niederösterreich. *Open Online Journal for Research and Education*. (8).

Lamb, M., & Arisandy, F. E. (2020). The impact of online use of English on motivation to learn. *Computer Assisted Language Learning, 33*(1-2), 85–108.

Lunsford, M. L., & Pendergrass, M. (2016). Making Online Homework Work. *PRIMUS, 26*(6), 531–544.

Micheuz, P. (Ed.) (2013). *Digitale Schule Österreich: Eine analoge Standortbestimmung anlässlich der eEducation Sommertagung 2013.* Wien: Österreichische Computer Gesellschaft.

Mulley, U., & Zuliani, B. (2013). Ein Digitales Kompetenzmodell für die Volksschule. In P. Micheuz (Ed.), *Digitale Schule Österreich. Eine analoge Standortbestimmung anlässlich der eEducation Sommertagung 2013* (pp. 196–200). Wien: Österreichische Computer Gesellschaft.

Nadler, J. T., Weston, R., & Voyles, E. C. (2015). Stuck in the middle: the use and interpretation of mid-points in items on questionnaires. *The Journal of general psychology, 142*(2), 71–89.

Nársoy, T. (2013). Kein Kind ohne digitale Kompetenzen!: Das digi.komp8-Konzept: Wie eine solide Basis an digitalen Kompetenzen an allen Neuen Mittelschulen in Österreich sichergestellt werden kann. In P. Micheuz (Ed.), *Digitale Schule Österreich. Eine analoge Standortbestimmung anlässlich der eEducation Sommertagung 2013* (32-46). Wien: Österreichische Computer Gesellschaft.

OECD (2005). *The OECD Program Definition and Selection of Competencies: Executive Summary.* Retrieved June 13, 2020, from http://www.oecd.org/dataoecd/47/61/35070367.pdf.

OECD (2015). *Students, Computers and Learning: Making the Connection.* Paris: OECD.

OECD (2018). *PISA 2021 ICT Framework.*

Perdian, D. C. (2013). Early Identification of Student Performance and Effort Using an Online Homework System: A Pilot Study. *Journal of Science Education and Technology, 22*(5), 697–701.

Ratcliffe, S. (Ed.) (2016). *Oxford essential quotations: Over 12600 quotations* (4. ed.). Oxford: Oxford University Press.

Reinders, H., & Benson, P. (2017). Research agenda: Language learning beyond the classroom. *Language Teaching, 50*(4), 561–578.

Rhodes, M. T., & Sarbaum, J. K. (2015). Online Homework Management Systems: Should we Allow Multiple Attempts? *The American Economist, 60*(2), 120–131.

Richards, J. C. (2015). The Changing Face of Language Learning: Learning Beyond the Classroom. *RELC Journal, 46*(1), 5–22.

Richards-Babb, M., Drelick, J., Henry, Z., & Robertson-Honecker, J. (2011). Online Homework, Help or Hindrance? What Students Think and How They Perform. *Journal of College Science Teaching, 40*(4), 81–93, from https://uaccess.univie.ac.at/login?url=https://search.proquest.com/docview/870285026?accountid=14682.

Ron Garland (1991). The Mid-Point on a Rating Scale: Is it Desirable? *Marketing Bulletin, 3*(2), 66–70.

Roth, V., Ivanchenko, V., & Record, N. (2008). Evaluating student response to WeBWorK, a web-based homework delivery and grading system. *Computers & Education, 50*(4), 1462–1482.

Schiefele, U., & Köller, O. (2018). Intrinsische und extrinsische Motivation. In D. H. Rost, J. R. Sparfeldt, & S. Buch (Eds.), *Beltz Psychologie 2018. Handwörterbuch pädagogische Psychologie* (5th ed., pp. 304–310). Weinheim, Basel: Beltz.

Shute, V. J., Sun, C., & Asbell-Clarke, J. (2017). Demystifying computational thinking. *Educational Research Review, 22*, 142–158.

Ulbing, N. (2013). Lernen in heterogener Lerngemeinschaft mit E-Learning. Ein didaktischer Mehrwert? In P. Micheuz (Ed.), *Digitale Schule Österreich. Eine analoge Standortbestimmung anlässlich der eEducation Sommertagung 2013* (pp. 248–258). Wien: Österreichische Computer Gesellschaft.

Wahlmüller-Schiller, C. (2017). Bildung 4.0 – der Weg in die Zukunft. *e & i Elektrotechnik und Informationstechnik, 134*(7), 382–385.

Wood, P. M., & Bhute, V. (2019). Exploring student perception toward online homework and comparison with paper homework in an introductory probability course. *Journal of College Science Teaching, 48*(5).

Würffel, N. (2011). E-Learning in Schule und Unterricht: Teil 1: Eine mediendidaktische Annäherung. *Schulmagazin 5-10*. (3), 55–58.

Yang, Y.-F. (2011). Engaging students in an online situated language learning environment. *Computer Assisted Language Learning, 24*(2), 181–198.

Zhou, Y., Chai, C. S., Liang, J.-C., Jin, M., & Tsai, C.-C. (2017). The Relationship Between Teachers' Online Homework Guidance and Technological Pedagogical Content Knowledge about Educational Use of Web. *The Asia-Pacific Education Researcher, 26*(5), 239–247.

9.1. Figures

10. Appendix

10.1. Online Questionnaire

Seite 01

Einleitung

Fragebogen Cyber Homework

Du bist herzlich eingeladen am Online **Fragebogen zu "MORE! Cyber Homework"** teilzunehmen. Dieser wird im Rahmen meiner Masterarbeit für das Unterrichtsfach Englisch an der Universität Wien durchgeführt.

Alle Daten, die du hier angibst, werden streng vertraulich, anonym und nach Datenschutzrichtlinien behandelt.

Für diesen Online Fragebogen wirst du ungefähr **5-7 Minuten** brauchen.

Falls du noch Fragen zu dieser Studie, beziehungsweise zum Online-Fragebogen haben solltest, findest du am unteren Ende jeder Seite eine E-Mail-Adresse, unter welcher du mich, Benjamin Würfel, kontaktieren kannst.

Seite 02

Sozio

Angaben zu deiner Person

Geschlecht	[Bitte auswählen]
Alter	(bitte gib hier dein Alter ein.)
Deine Schulstufe	[Bitte auswählen]

Seite 03

Comp

Nutzung des Computers

Computer meint hier: Laptop, Standcomputer oder Tablet (**nicht Smartphone/Handy**).

Wähle bitte das Passende aus.

1) An wie vielen Tagen einer Woche benutzt du normalerweise den Computer?

Für Schulzwecke:

[Bitte auswählen]

Für alles andere (Spiele, Musik, YouTube ...)

[Bitte auswählen]

2) An wie vielen Tagen einer Woche benutzt du während der Corona-Krise den Computer?

Für Schulzwecke:

[Bitte auswählen]

Für alles andere (Spiele, Musik, YouTube ...)

[Bitte auswählen]

3) Hast du einen Computer, der nur dir gehört?

- ja
- nein

4) Wenn ich ein Problem mit dem Computer habe, dann kann mir jemand aus meiner Familie (Mama, Papa, Schwester, Bruder, ...) helfen.

Bestimme wie sehr diese Aussage auf dich zutrifft.

Immer	Manchmal	Selten	Nie

Seite 04

ss1

Deine Meinung ist gefragt! (Seite 1/2)

Jetzt folgen einige Aussagen über die Cyber Homework. Bitte gib bei jeder Zeile an, **wie stark** du zustimmst.

Bitte kreuze das Zutreffende an!	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Während einer Cyber Homework vergeht mir oft die Lust weiterzumachen.	○	○	○	○	○
Ich gebe mir Mühe, weil ich die Cyber Homework gerne mache.	○	○	○	○	○
Ich hätte die Cyber Homework auch gemacht, wenn sie nichts zu meiner Note beiträgt.	○	○	○	○	○
Ich gebe mir Mühe bei der Cyber Homework, weil ich eine gute Note haben möchte.	○	○	○	○	○
Ich freue mich immer auf die Cyber Homework.	○	○	○	○	○
Die Cyber Homework macht mir Spaß.	○	○	○	○	○

	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Ich kann alle notwendigen Sonderzeichen auf der Tastatur schreiben (?,!, ‘, ..)	○	○	○	○	○
Das Bedienen der Webseite e-zone ist leicht.	○	○	○	○	○
Das Schreiben mit der Tastatur fällt mir leicht.	○	○	○	○	○
Ich arbeite gerne am Computer.	○	○	○	○	○

	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Ich kenne mich bei den verschiedenen Aufgabenstellungen (zum Beispiel: Kreuzworträtsel, Bilder beschriften, ...) der Cyber Homework gut aus.	○	○	○	○	○
Ich weiß wo ich bei der Cyber Homework klicken muss, damit ich alle Übungen machen kann.	○	○	○	○	○
Mir muss eine Person (Mama, Papa, Bruder, Schwester, Lehrer/in ...) erklären, was in einer Übung zu tun ist.	○	○	○	○	○

Seite 05

ss2

Deine Meinung ist gefragt! (Seite 2/2)

Bitte gib wieder bei jeder Zeile an, **wie stark** du zustimmst.

Bitte kreuze das Zutreffende an!	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Die Cyber Homework hilft mir das Gelernte zu wiederholen.	○	○	○	○	○
Ich möchte bei allen Übungen der Cyber Homework 100% erreichen.	○	○	○	○	○
Die Cyber Homework ist manchmal zu schwer für mich.	○	○	○	○	○
Ich mache manche Übungen noch einmal, um dann alles richtig zu haben.	○	○	○	○	○
Ich kann mit den Aufgaben der Cyber Homework schnell fertig werden, da die Aufgaben leicht für mich sind.	○	○	○	○	○
Ich glaube, dass mich die Cyber Homework beim Englisch Lernen unterstützt.	○	○	○	○	○

	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Technische Probleme erschweren mir die Cyber Homework, weil alles viel länger dauert oder gar nicht funktioniert.	○	○	○	○	○
Der Online Zugang funktioniert immer ausgezeichnet.	○	○	○	○	○
Es ist frustrierend/ärgerlich, wenn die Cyber Homework nicht funktioniert.	○	○	○	○	○
Es gibt oft technische Probleme mit der Cyber Homework.	○	○	○	○	○

	Stimme **nicht** zu	Stimme **eher nicht** zu	Weder noch	Stimme **eher** zu	Stimme **voll** zu
Mir gefällt, dass ich am Ende jeder Übung sofort sehe, wie viel ich richtig habe.	○	○	○	○	○
Im Vergleich zu Hausübungen im Workbook, gefällt mir die Cyber Homework besser.	○	○	○	○	○
Ich brauche für die Cyber Homework kürzer als für eine gleich lange Hausübung im Workbook.	○	○	○	○	○
Ich denke ich lerne bei der Cyber Homework mehr als bei einer Hausübung mit Stift und Papier.	○	○	○	○	○
Ich glaube, ich bin bei der Cyber Homework besser als bei der Hausübung im Workbook.	○	○	○	○	○

Seite 06

BEW

Jetzt darfst du bewerten!

Welche Schulnote würdest du der Cyber Homework im Fach Englisch **generell** geben?				
1 - Sehr gut	**2** - Gut	**3** - Befriedigend	**4** - Genügend	**5** - Nicht genügend
○	○	○	○	○

Welche Schulnote würdest du der Cyber Homework im Fach Englisch **während der Corona-Krise** geben?				
1 - Sehr gut	**2** - Gut	**3** - Befriedigend	**4** - Genügend	**5** - Nicht genügend
○	○	○	○	○

Letzte Seite

Vielen Dank für deine Teilnahme!

Ich möchte mich ganz herzlich für deine Mithilfe bedanken. ☺

Deine Antworten wurden gespeichert, du kannst das Browser-Fenster nun schließen.

Benjamin Würfel B.Ed., Universität Wien – 2020

10.2. Form of Consent

Einverständniserklärung

Ich, _____, erlaube meiner/m Tochter/Sohn, _____, dass sie/er an der Studie über ***Cyber Homework*** teilnimmt. Diese wird im Rahmen der Masterarbeit für das Unterrichtsfach Englisch an der Universität Wien durchgeführt. Betreut wird die Arbeit von Mag. Dr. Julia Hüttner, MSc. (julia.huettner@univie.ac.at).

Die Studie besteht aus einem Fragebogen zum Thema *Cyber Homework* und zwei Hausübungen, welche bearbeitet werden. Es werden keine schülerspezifischen Daten erhoben und alle Daten werden anonymisiert verarbeitet.

Falls noch Fragen auftauchen oder Sie interessiert wären, dass ich Ihnen die Ergebnisse (ca. Sommer 2020) weiterleite, können Sie sich jederzeit an mich, Benjamin Würfel (benjamin.wuerfel@schulschiff.at), wenden.

Datum, Unterschrift: _____

10.3. Abstract (English)

Due to the overreaching influence of digital media, it is nowadays necessary for individuals to adapt to the newly emerged digital requirements and orient themselves in the computerised landscape. Hence, paramount importance is ascribed to the teaching of *digital competence*, which guarantees that students are capable to handle the digital challenges of today and the future. In the case of Austria, this translates to the current aim of the concept *Schule 4.0* to have all students educated accordingly via *Basic Digital Education* ("Digitale Grundbildung").

Although not explicitly mentioned for the realisation of this plan, online homework systems, such as the investigated *MORE! Cyber Homework,* represent a significant factor in this context. The thesis reveals that this online learning platform partially supports the demands of the Austrian curriculum for aspects of digital competence. Furthermore, the theoretical framework shows that motivational and organisational effects can be beneficial for teachers, as well as students. This claim could be validated via the analysis of a quantitative online questionnaire with 95 students of two Viennese schools. The results of the survey show that especially the motivational gains were not as high as initially assumed, which evidently was connected to the students' recently elevated experience of frustration with this online homework platform. This negative sensation was caused by a nationwide increase in usage due to the Covid-19 pandemic and related measures in distance learning. The study revealed valuable insights for teachers about *MORE! Cyber Homework* and additional motivational gains for students when working with computers.

10.4. Zusammenfassung (Abstract German)

Digitale Medien haben einen weitreichenden Einfluss auf das alltägliche Leben. Individuen müssen deshalb in der Lage sein, sich an die digitalen Gegebenheiten anzupassen. Aus diesem Grund ist die digitale Bildung in der Schule unumgänglich. Schülerinnen und Schüler müssen digitale Kompetenzen erwerben, um sich in der digitalisierten Welt zurecht zu finden. Diese Masterarbeit beschäftigt sich mit dem österreichischen Konzept *Schule 4.0* und dem damit eng verbundenen Schulfach *digitale Grundbildung*.

Online Lernplattformen, wie *MORE! Cyber Homework*, werden in dem Konzept des Bildungsministeriums nicht explizit genannt, stellen jedoch für die Vermittlung von digitalen Kompetenzen einen wichtigen Faktor dar. Diese Lernplattform entspricht zum Teil Anforderungen des österreichischen Lehrplans zur digitalen Grundbildung. Die theoretische Auseinandersetzung hat ergeben, dass die Nutzung motivierende und strukturierende Effekte sowohl für Lehrpersonen als auch für Schülerinnen und Schüler mit sich bringen kann. Diese Behauptung konnte anhand einer quantitativen online Studie mit 95 Schülerinnen und Schüler zweier Wiener Schulen validiert werden. Entgegen der Annahme zeigen die Ergebnisse, dass die motivierenden Effekte weniger stark ausgeprägt sind. Als wichtiger Einflussfaktor wurde hierbei das Empfinden von Frustration mit der Hausübungs-Plattform während der Covid-19 Pandemie identifiziert. Die Studie ermöglicht Lehrpersonen wertvolle Einblicke in das Arbeiten mit der online Plattform *MORE! Cyber Homework* und verdeutlicht motivierende Auswirkungen auf die Motivation der Schülerinnen und Schüler bei der Arbeit mit dem Computer.