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# Learning analytics to improve writing skills for young children – an holistic approach

LA to improve writing skills

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## Abstract

**Purpose** – Due to the important role of orthography in society, the project called IDeRBlog presented in this paper created a web-based tool to motivate pupils to write text as well as to read and to comment on texts written by fellow students. In addition, IDeRBlog aims to improve student's German orthography skills and supports teachers and parents with training materials for their students. The paper aims to discuss these issues.

**Design/methodology/approach** – With the aid of learning analytics, the submitted text is analyzed and special feedback is given to the students so that they can try to correct the misspelled words themselves. The teachers as well as the parents are benefiting from the analysis and exercises suggested by the system.

**Findings** – A recent study showed the efficiency of the system in form of an improvement of the students' orthographic skills. Over a period of four months 70 percent of the students achieved a significant reduction of their spelling mistakes.

**Originality/value** – IDeRBlog is an innovative approach to improving orthography skills combining blogging and new media with writing and practice.

**Keywords** Technology enhanced learning, Learning analytics, German orthography, German spelling acquisition

**Paper type** Research paper

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## Introduction

IDeRBlog enables students aged eight and above to write texts about a favorable topic on a computer, smartphone, or tablet connected to the web. Besides enhancing their media literacy by taking advantage of innovative ways of writing, students also improve their orthography skills. This is due to the fact that underlying the website is an “intelligent dictionary” which was developed within the frame of the project (Edtstadler *et al.*, 2015). The dictionary analyses the spelling mistakes made by students. It provides not only feedback of how to correct mistakes, but also offers students and teachers alike an evaluation of the analysis of their spelling errors. On basis of this analysis students are directed to individual online or print exercises and training courses, in order to work on their difficulties. At the same time, students can publish their texts in a blog which can either be accessed by all members of the class, or the school users of the IDeRBlog-platform. Consequently, students can read the texts of fellow students and have the possibility to comment on them.

The aim of the website is to intrinsically motivate pupils to write texts as well as to read and to comment on texts written by fellow students and continuously considering the improvement of German orthography. The skill of writing orthographically correct is widely regarded as the basis of successful participation in school, later on in work life and everyday life within society (Grünke and Weber, 2015, p. 176). Due to Edtstadler *et al.* (2015, p. 6) the explanation for the significance of the orthography may be the following: “In contrast to other areas of language learning, there is hardly space to argue about the correct or incorrect spelling of a word. This orthographical stiffness can probably serve as an explanation for its importance.” Consequently, it is extremely important to detect possible spelling difficulties, in order to help students by giving individual support and tools to improve orthography skills autonomously (Ebner *et al.*, 2015, p. 118).

The ongoing digitalization of society and everyday life changes the way of writing fundamentally. While students write with pen and paper in school they type in words, sentences and texts into smartphones, and computers when it comes to their leisure time. The use of social networking sites, communication tools, and apps is continuously increasing (Nagler *et al.*, 2016).

Media literacy becomes more and more important. It is not only the required ability to write using new media, but also the question of suitability of statements and media for a publication on the internet that arises. Privacy and the so called “right to forget” are important issues as well.

All of these aspects of orthography, writing, media literacy, and motivation are addressed by IDeRBlog. IDeRBlog is an abbreviation for “Individuell Differenziert Richtig Schreiben mit Blogs” (Individually Differentiated correctly wRiting with Blogs). The major aim of IDeRBlog was the development of a website that combines free writing opportunities with the improvement of orthography skills.

### *Registration and privacy policy*

In order to use IDeRBlog students, teachers and their corresponding schools must be registered on the website. In this context, necessary information is the name of the teacher, the e-mail address, and the name of the school. Classes as well as students can be registered by teachers, too. The teacher can choose to register the students anonymously, e.g. with different names to ensure privacy. Due to privacy policies of the website, one cannot retrieve or even save this data. Privacy policies of Austria and the European Union apply to the website as well as the management and storage of the data.

## Theoretical background

### *Learning analytics (LA)*

LA is “the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in

which it occurs” (Siemens and Long, 2011). This process of analysis has different steps: capture, report, predict, and refine (Campbell *et al.*, 2007). These four steps can be used for a closed iterative LA-cycle, according to Clow (2012). Further, stakeholders can be added to the cycle, stating their mission and visions, according to Khalil and Ebner (2016). Interactions within platforms can be captured for later analysis to gain a deeper understanding of the learning process (Khalil and Ebner, 2015). LA allows to use these information to perceive learning issues and makes it possible for teachers to actively intervene (Siemens and Long, 2011; Greller and Drachsler, 2012; Greller *et al.*, 2014). Appropriate visualizations can be used to provide insights for teachers, students, parents and academic personnel as well (Ruiprez-Valiente *et al.*, 2015). This feedback has to be presented in a simple and informative way to reach out to all stakeholders involved in the process (Baker *et al.*, 2012; Neuhold, 2013; Leitner *et al.*, 2017).

### *Intelligent dictionary*

The project’s main objective is to create more than a simple spell checker by developing the so called “intelligent dictionary.” The main idea is that the student gets a hint for correcting spelling mistake by providing specific feedback instead of only flagging a mistake and/or offering the correctly spelled word. In order to accomplish this task (for details see Edtstadler *et al.*, 2015), the misspelled words are categorized into different orthographic areas, which are assigned to phenomena and are linked with corresponding feedback for giving hints for correcting mistakes. This way a modern didactic approach to learning and teaching German orthography is implemented, which focus on cognitive clarity (Ebner *et al.*, 2017). In order to retrieve a manageable amount of categories for the teachers’ qualitative analysis, the phenomena are merged into categories, for which additional orthographic exercises are available on the platform.

### *Learning theory constructivism*

The IDeRBlog website is mainly based on the principles of constructivism as a learning theory. Within this theory, knowledge is defined as an individual construct of the human mind rather than a copy of reality (Reinmann and Mandl, 2006, p. 626). This construction is characterized by self-organization and active autonomous learning of the individual (Reinmann, 2005, p. 155). These two aspects are especially encouraged while working with IDeRBlog. This is due to the fact that students manage their account as well as their texts on their own and work autonomously.

The design and realization of the website was mainly influenced by the concept of situated learning (Gros *et al.*, 2015, p. 22). In the context of learning and teaching, situated learning evolved within the situated cognition movement. The movement emphasized constructivist elements of learning and prioritized constructivist aspects of pedagogy. From this point of view, learning always occurs within a social context and is characterized by the individual experiences of the learner. On basis of these experiences, knowledge is actively constructed by the learner (Reinmann and Mandl, 2006, p. 627). In the process of learning, various tools and aids are used in order to complete an exercise or solve a specific problem (Fischer *et al.*, 2009, p. 754).

Students working with the IDeRBlog website using different tools and aids in order to improve their German orthography skills. First of all, students receive feedback from the “intelligent dictionary” giving them advice on how to correct their spelling errors. Second, the teacher supports the students if they cannot draw the right conclusions based on the feedback. Third, in a later stage of the working process the discussion of the texts within the blog realized by the commentary function enables students to support each other. Especially, advice on writing skills beyond orthography skills, for example, choice of words, grammar or narrative style can be discussed within the blog.

The primary aim with constructivism is the flexible application of newly acquired knowledge. Besides that, the skills to organize and to solve problems autonomously are prioritized. Last but not least, the creation of (cognitive) strategies is defined as a major aim in a constructivist learning experience (Reinmann and Mandl, 2006, p. 627). Hence, strategies learned and internalized with the help of the feedback by the “intelligent dictionary” ought to be applied to different words of the same orthographic phenomena. Therefore, students should be able to correct and to prevent spelling mistakes with the help of those strategies developed.

In the context of constructivism, a formative evaluation of learning outcomes is considered as being rather significant. The focus is on the development of the individual learning process of each student. This is observed and evaluated independently from the performance of other students or the achievement of strictly defined learning goals (Reinmann and Mandl, 2006, p. 628). Consequently, continuous feedback concerning the individual learning process plays a major role. It serves as a point of reference, not only for the teacher but at the same time for the student (Reinmann and Mandl, 2006, p. 628). Furthermore, the feedback allows the student to review and control his learning progress (Fischer *et al.*, 2009, p. 758). This aspect is realized within IDeRBlog by the continuous support of the learner through the feedback of the “intelligent dictionary” as well as the analysis of the spelling errors.

The IDeRBlog website can be considered as an example of a moderate constructivism (Reinmann and Mandl, 2006, p. 638). Moderate basically means that the assumption that all knowledge is exclusively constructed by the learner cannot entirely be hold up. There needs to be at least a small foundation of knowledge upon which the individual can build and acquire as well as construct new knowledge (Reinmann and Mandl, 2006, p. 638). Hence, new knowledge is based and constructed upon former knowledge and experiences of the learner. As a result, a moderate constructivism cannot completely refrain from instruction. In this context, the acquisition of new knowledge is rather an interplay between construction and instruction (Reinmann and Mandl, 2006, p. 639). The already existing knowledge is the learner’s ability to allocate sounds to corresponding letters correctly (Grünke and Weber, 2015, p. 178) and a basic knowledge of German orthography. This knowledge is enhanced during the work with IDeRBlog due to the fact that the text production is based upon an elementary understanding of the German orthography (Grünke and Weber, 2015, p. 177).

### *Research design*

The development of the prototype (Holzinger *et al.*, 2005) is based on four steps according to Alavi (1984) and Larson (1986): identifying basic requirements, development of a working prototype, implementation and usage (field study), and revision. Concerning the “intelligent dictionary” in a first step the orthographic areas, categories, and phenomena were constructed in a way to fulfill the scientific, practical, and technical requirements (Edtstadler, 2015) as well as other aspects of a qualitative analysis of orthographic mistakes (Edtstadler, 2015). In a next step, the words were selected and the orthographic mistakes were assigned to the system and the “intelligent dictionary” was implemented to the parallel programmed web-based platform. We collected the requirements and implemented a prototype (Ebner *et al.*, 2016) with pupils as co-designer (Johnson *et al.*, 2014) and focus on LA. The evaluation was conducted with our partner schools (Ebner *et al.*, 2017).

### **Pedagogical concept of IDeRBlog**

Writing, as well as reading and calculating, is one of the key competences of a society. All three of these competences build the foundation of a successful participation in everyday school life and in the later work and social life.

The competence of writing contains several fields of competences (Bremerich-Vos, 2011), such as the ability of writing (e.g. handwriting or using the computer), spelling (e.g. considering the orthography), and composing texts (e.g. planning, structuring and revising texts).

These aspects are taken into account within the IDeRBlog project and brought together by using digital technologies and are enhanced by reading as an additional area of competence. Furthermore, several aspects of the fourfold model for teaching German in primary school (Brinkmann, 2015) are considered by using the platform. In the writing area of IDeRBlog students apply their existing knowledge of writing while composing their texts. Furthermore, working with the “intelligent dictionary” contains a systematic approach to German orthography and enables students to practice their orthographic skills with the goal of writing correctly. Reading skills are improved by perusal of blog entries written by fellow students.

A necessary requirement for using the IDeRBlog-platform is according to Ebner *et al.* (2017) “that children have acquired the alphabetic principle of German orthography. This means that the children should apply at least the basic correspondences between phonemes and graphemes. The deeper understanding of other strategies, e.g. the morphological strategy, is supported by the intelligent dictionary.”

Due to the fact that IDeRBlog allows and encourages the publication of written texts it addresses the motivational aspect of writing. One can presume that the relevance of the written text is elevated by the opportunity to publish it on the blog of the class or school. Consequently, this spurs students into being motivated to write even more texts having a positive impact on the author’s orthography skills as the skill of orthographically correct writing can only be acquired and further improved by writing (Augst and Dehn, 2015). A crucial part of text writing is revising concerning two aspects: One aspect refers to the mode of expression and the correct application of grammar. This review of the text can be done in different ways. Students can check their texts on their own or work with a fellow student in a so-called writing conference in order to improve the style of the text. The second aspect refers to orthography and is strongly linked to text writing as the motivation of “wanting to write more” plays a decisive role in acquiring German orthography, which is supported by the “intelligent dictionary” of the IDeRBlog-platform. This digital tool highlights orthographic mistakes in two different background colors in order to direct the student’s attention toward them. In case the mistake is categorized and thus, a feedback is available, the students apply different strategies in order to spell words correctly with the help of the hint for correcting the mistake provided by the “intelligent dictionary.” These strategies are learned beforehand – either by the teacher or by the training course of the platform – and systematically applied repeated by the “intelligent dictionary.” This way, the strategies are (hopefully) memorized and also applied in different contexts.

In research and practice, a wide range of didactic approaches for teaching German orthography exists (for an overview: Brinkmann, 2015). They range from rather linguistically orientated approaches, taking into account the theory of German orthography with its principles and rules to quite simplified views. The so-called “FRESCH” method according to Renk and Brezing (2015), for example, is based less on orthographic rules but rather on a small set of strategies. In view of this approach, students apply a small number of different strategies in order to deduct the correct spelling of words. IDeRBlog takes both of these approaches into account. The feedback of the “intelligent dictionary” can be configured according to the approach already used in class. Hence, the use of IDeRBlog does not necessarily go along with a break in teaching strategies.

All of the pedagogical approaches are based on the assumption that orthography and the correct spelling of words need to be trained and repeated regularly. IDeRBlog addresses this aspect with an integrated training database. Students are able to access more than

500 exercises in order to improve their orthographic skills without registration and free of charge. The database includes online and print exercises, which focus on the training of German orthography in isolation, allowing a balanced training with analogue and digital media alike. Within the training area, students can choose between various exercises belonging to different orthographic categories. These exercises can be worked on independently in order to improve one's orthography skills. Especially digital exercises have the benefit of providing students with a direct feedback if they make a spelling error which is not the case with analogue worksheets or textbooks. This blending of different teaching approaches makes IDeRBlog diverse (Steinhauer, 2017).

In addition to "analogue" pedagogical approaches to writing, new approaches influenced by writing within digital media are considered and pursued. These new approaches are consistent with those being depicted and called for by the strategy of the Kultusministerkonferenz (conference of ministers of culture) in their paper "Bildung in der digitalen Welt" (education in a digital world) (Klingenberg, 2017). Furthermore, the normative writing of texts with the help of a keyboard is trained while working with IDeRBlog. As a result, the implementation and application of text processing programs and related digital writing situations is initiated.

### Platform concept

The diagram shown in Figure 1 illustrates the workflow on the IDeRBlog website with the student's area being the core of the platform. Most of the other functions evolve around it, emphasising on the student and his or her learning process in the central position.

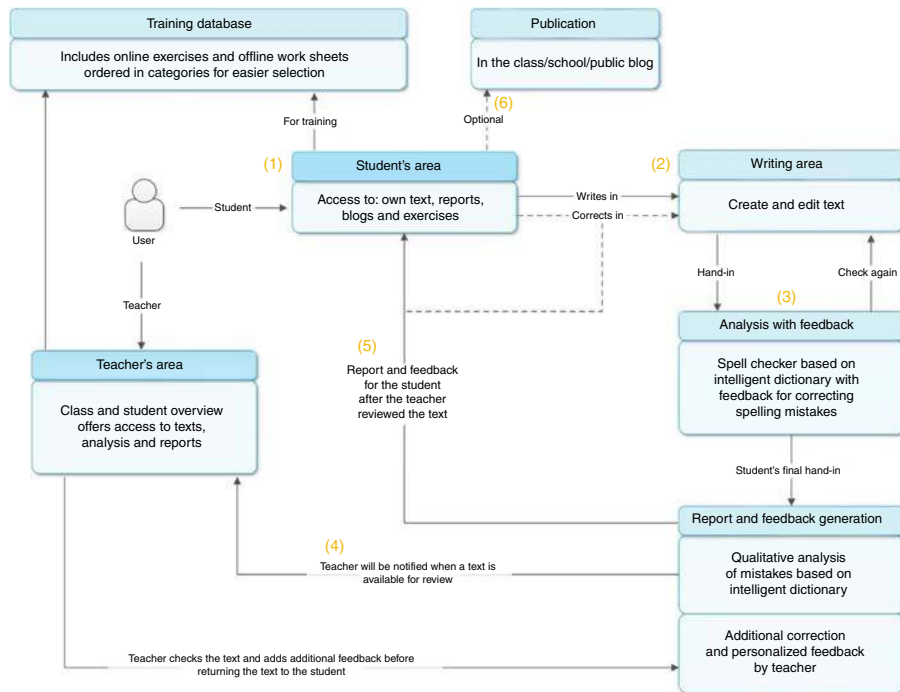


Figure 1.  
Workflow of the  
IDeRBlog website

Source: Ebner *et al.* (2017)

### *Student's area*

After the login students are directed to the student's area (1). This is the starting point for all activities how students can engage with IDeRBlog. The core activities consist of the writing area, the access to texts already written by the student, the blog and the evaluation of the analysis.

### *Writing area*

In the writing area (2) the student types their text into an editor, as shown in Figure 2. Having finished the text, the student can have their texts spell checked by the "intelligent dictionary" (3). Spelling mistakes are highlighted and feedback for an autonomous correction is offered. The student then corrects their spelling mistakes and if necessary has the text spell checked by the "intelligent dictionary" once more. At any time of the writing process, there is always the possibility of saving the text for later in case the student prefers to continue their work at some other time.

If the student has finished the text, it can be handed in. Consequently, the teacher receives the pupil's text (4) and can proofread it. If necessary, further alterations and correction can be performed by the teacher. Additionally, the teacher can write a personal feedback to the student. The teacher then decides whether the text needs to be rewritten or if it is well done and suitable for publication on the blog. In this case, suitability is not only based on spelling mistake or grammar, but also on the general content of the text and its appropriateness for publication (5).

Last but not least, the student gets the text back and decides whether the text should finally be published in the blog or not (6).

### *Evaluation and exercises*

Parallel to the writing process the intelligent dictionary analyses and logs all of the spelling mistakes and attempts of corrections made. After having written a certain amount of words and having made a number of spelling errors the student receives an evaluation in terms of orthography skills. Based on the analysis, the student get offered various print and online

**Figure 2.**  
Text writing area



exercises. The teacher receives an evaluation of the orthography skills of the whole class as well as of each individual student, too. The process of analyzing and evaluating will be discussed in more detail later on in this paper.

### *Blogging*

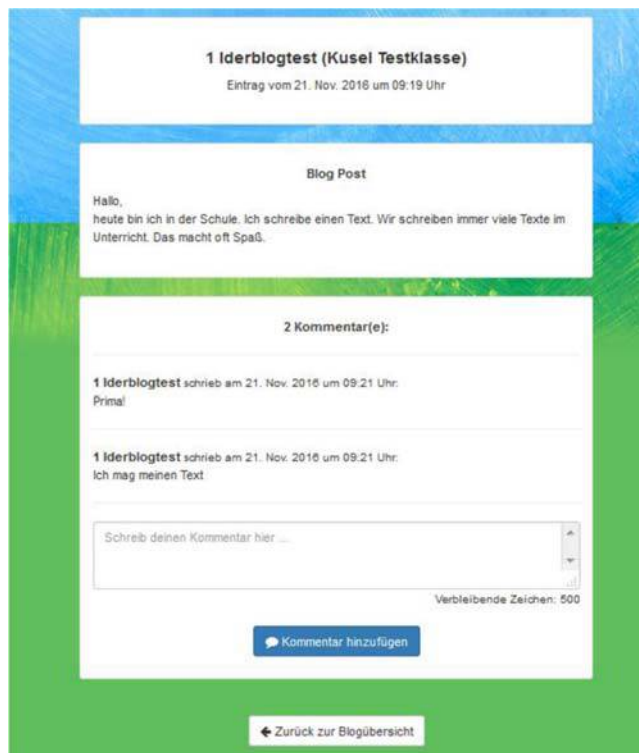
The fact that the text is finally published by the student is regarded as a part of media literacy education. The student needs to decide whether the text is suitable for a wider audience or not. Further, the student as the author of the text, chooses to publish or to retain his work.

In this context, it must be stated that each blogging entry only shows the nickname of the user as well as date and time of publication. The real name of the student cannot be inferred from it, not even in a public blog. Yet, within a class – as it is often on the internet – it is rather easy especially for the teacher to identify to which student a blog entry belongs to.

Independent from the configurations made by the teacher beforehand the student's text is automatically published in a personal blog accessible only by the student. Whether the entries of the students are published within the class, the school or on the internet depends on the teacher's choice of configurations.

### *Commenting and reading*

On the IDeRBlog website, pupils are not only able to write and publish their texts, they also get the opportunity to read and comment on published texts of fellow students, as shown in Figure 3. These comments can only be seen by those people who are also able to see the



**Figure 3.**  
Area for Blog entries  
and comments

blog itself. For instance, a class blog cannot be accessed and commented on by the public or someone belonging to another class or school.

In general, it is the teacher's choice to allow comments or not. Furthermore, the teacher also decides whether comments can be published directly or whether the teacher has to check these beforehand. Allowing comments to be made without censorship at the teacher, creates a lot of opportunities to improve the media literacy of students. If some inappropriate comments are written, these can be discussed in class. Guidelines for an appropriate behavior and use of language on the internet can be developed starting with a minor mistake of a student having, for example, written an offensive comment. Furthermore, differences between analog and digital communication can be discussed and elaborated. In a worst-case scenario, inappropriate comments can also be deleted by teachers.

### *Training database*

In addition to writing, blogging, and reading pupils can improve their orthography skills by making use of the exercise database on the IDeRBlog website. Consisting of around 500 print and online exercises, the database can be accessed without registration. The database consists of worksheets and various online exercises created by the IDeRBlog project team. The other exercises derive from extensive research on the internet and are integrated as links to the website. These collected exercises were checked at least twice by the project team according to established criteria with regard to the exercises being correct, accessible and suitable for the target group of younger students.

The exact same pool of exercises can be retrieved via the "Erwachsenenseite" (a section of IDeRBlog created for teachers and parents) or via the "Kinderwelt" (starting page for students). Concerning the training database, these two only differ in the order and display of the individual exercises.

Accessing the exercises via the "Kinderwelt" the structure is based on the "Freiburger Rechtschreibschule (FRESCH)." FRESCH is an approach to improve orthographic skills by relying less on formal rules and more on spelling error prevention as well as avoidance. In order to put this concept into action, different strategies of deducting the correct spelling are learned, memorized, and applied (Renk and Brezing, 2015).

Students can decide whether they prefer to improve their orthography skills with the help of online or print exercises. In a next step, they chose between six different FRESCH categories. These derive from the different FRESCH strategies and encompass:

- (1) "Ableiten" (students deduct for example that words are written with "ä" in the plural form due to the fact that they derive from a word written with a in the singular form).
- (2) "Groß und Klein" (a set of questions is applied in order to decide whether a word begins with a capital letter or not).
- (3) "Merkwörter" (words that have to be learnt by heart).
- (4) "Rhythmisches Verlängern" (students form the plural form of words in order to decide on the final consonant being an d or t, g or k, p or b which are often homophones in the singular form of the word).
- (5) "Schwingen und Schreiben" (students divide words into single syllables in order to hear all of the word's letters and write it correctly).
- (6) "Zusammen/Getrennt" (students decide whether two or more words build a compound or not).

Then the exercises involving the chosen FRESCH strategy are displayed in Figure 4. The title of the exercise as well as the FRESCH category and a screenshot are provided likewise. A click on the link below the exercise causes a new window to open and thereby



**Figure 4.**  
Overview of the  
exercises for children  
categorized by  
FRESCH

leads the student directly to the exercise. Having finished the exercise the student closes the window and automatically finds himself or herself back at the database of exercises and can choose his or her next tasks.

In contrast to that, exercises in the “Erwachsenenwelt” are structured based on the theory of German orthography. First, the teacher chooses between the morphological, phonological, syntactical or lexical level. Then the exercises belonging to the chosen category are displayed. Information about each exercise is given in the title and is enriched by a screenshot. Furthermore, teachers and parents receive additional information about each exercise before being directed to the exercise itself. Short profiles of the exercises are presented containing information about the author and topic of the exercise. In addition, the amount of words as well as miscellaneous information about the task is given. Consequently, the teacher can easily find an exercise suitable for the individual needs and skills of the student. Due to the numbering of the exercises the teacher is able to tell the student which exercise to search for and complete.

Both areas of the website, the “Kinderwelt” as well as the “Erwachsenenseite”, provide courses on various orthographic phenomena. These courses can be completed online and consist of two explanations of the orthographic phenomenon, online as well as print exercises and links to additional exercises of the chosen linguistic or FRESCH category.

In the context of the training database the IDeRBlog website also offers the possibility of searching for exercises in the print as well as in the online section of the database. The applicable search parameters are listed below the search field and are in accordance with the children’s as well as the teacher’s version of the database.

### Supporting teacher and parents

IDeRBlog aims at a wide-ranging support for teachers implementing IDeRBlog in their school and lessons. These can be found on the “Erwachsenenseite.” Besides the materials offered within the frame of the training database, several tutorials are provided.

These are short videos dealing with different IDeRBlog topics and explaining various functions of the website.

Furthermore, manuals depicting almost all of the website's functions were drawn up. One version was specifically written for students aged 8 and above while a second more detailed one was written having teachers and parents using IDeRBlog in mind. Dates for differentiated workshops and online seminars introducing IDeRBlog are regularly published on the website.

IDeRBlog also offers information and digital presentations with regard to independently organized workshops or parents-teacher conference. These materials contain first of all general information about IDeRBlog. In addition, different versions of the presentations were created containing references to curricula in Germany, Austria, and the German-speaking community of Belgium. In this context, a consent form for parents allowing their child to work with IDeRBlog in school is provided, although, this mainly concerns the work with a public blog.

The IDeRBlog website itself as well as all of the provided materials are licensed under a Creative Commons License (CC-BY) and serve as an open educational resource (Schön and Ebner, 2017). Hence, these materials can easily be adapted and distributed according to individual needs.

### LA approaches

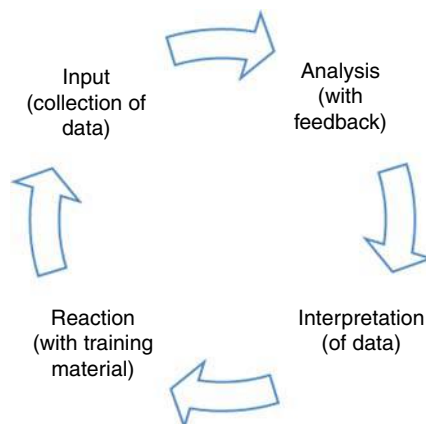
IDeRBlog pursues an approach to data mining and LA as defined by Siemens and Long (2011). The LA method chosen for the IDeRBlog website is a content analysis. It analyses the text typed in by students with a focus on spelling errors. In doing so a vast amount of data is collected involving, for example, the duration of the text production as well as the number of attempts of correcting the text.

Within the pursued LA approach the student is provided with the collected data involving their learning process in order to review and to improve their performance. Underlying this procedure is a circular workflow shown in Figure 5.

With each text, a student types into IDeRBlog the circular workflow repeats itself. In the following, the individual stages of the circular flow are depicted and related to the work performed by the student on the platform.

#### *Input collection of data*

Having logged into the writing area of the website by typing in their nickname and password, students write their text (see Figure 6). The writing of the text is independent of



**Figure 5.**  
Circular workflow of IDeRBlog



Hier kannst du deinen eigenen Text schreiben und abschicken.  
Du bekommst nach dem ersten Mal eine kurze Rückmeldung und hast dann  
nochmal Zeit deinen Text durchzulesen und zu verbessern. Danach kannst  
du den Text an deine Lehrperson schicken.

Ich ging häute mit meinem Hunt spatzieren. Dannach habe meine Muter und ich Tee gedrunken und  
Keekse gegesen.

Verbleibende Zeichen: 1890

**Figure 6.**  
Start writing a text  
on the platform

time and place. The website is permanently available. Students cannot only check their text for spelling errors, they can also save the text they are working on for later. The orthographic analysis of the written text starts with a click on “Jetzt Text kontrollieren” (German for: “check your text now”).

#### *Analysis of the data and direct feedback*

All of the spelling errors made by the student are displayed. There are two dictionaries underlying the employed spell checker system (see Figure 7). Words marked yellow derive from an open dictionary. Those words marked red are part of the intelligent dictionary and prioritized over the open dictionary for feedback.

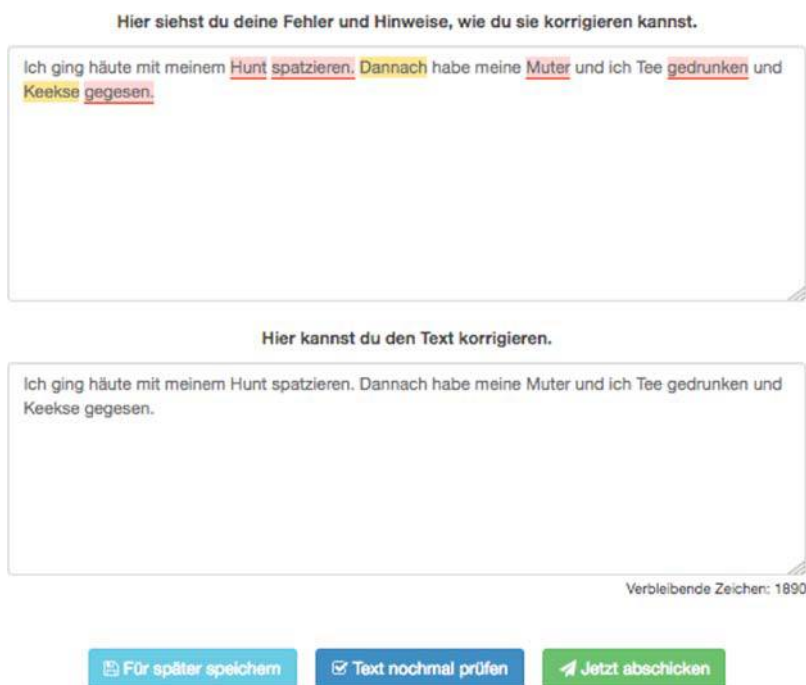
In this context, a direct feedback which allows students to correct their spelling errors autonomously is prioritized. In this phase, students analyze and reflect on their writing skills and spelling errors made. They gain routine and a feeling for the German language by reflecting on and remembering the system of orthographic rules. Hence, students improve their orthographic skills.

#### *Boundaries of the employed dictionaries*

In the process of spell checking, the entire spelling mistake cannot be detected. The dictionaries are not able to consider the semantic context in which a word is written. Consequently, words that are clearly misspelled in the given context yet would be correctly spelled in a different context cannot be highlighted as spelling errors. As shown in the screenshot above, one can gather from the semantic context that the student intended to write “heute” meaning today whereas he or she spelled it as “häute” meaning skins. The spelling mistake clearly derives from the fact that those words are homophones in German.

The words that are highlighted with a yellow background color solely tell the student that this is a potential spelling error.

In contrast to that, words highlighted with a red background color give the student a detailed feedback in form of a differentiated advice depending on the linguistic phenomena the spelling error belongs to, as shown in Figure 8. This is due to the fact that the spelling errors highlighted in red are part of the “intelligent dictionary” programmed by IDeRBlog. The detailed feedback ought to support the students to write the words orthographically correct.



**Figure 7.** Feedback presentation to the student



**Figure 8.** Feedback example with FRESCH (left) and general feedback (right)

There are two different feedback systems for the students highlighting the spelling mistakes in red. On the one hand, there is the feedback according to the orthography strategies of FRESCH which is depicted in Figure 8. On the other hand, there is a more general feedback solely based on the general rules of German orthography instead of specific strategies (see Figure 8). Which of the two options for the feedback is eventually applied can be decided by the teacher beforehand in the class' configurations menu.

Independent from the feedback chosen by the teacher all of the misspelled words are recorded and matched to one of the categories of German spelling errors. These categories form the basis for the analysis and evaluation of the student's texts. The evaluation is only statistically significant after a certain amount of words (500) has been written and a certain amount of spelling errors (60) was made. Hence, the evaluation can only be displayed to the teacher and the student, if these criteria are fulfilled.

### *Interpretation of data*

Having reached the abovementioned minimum number of words and spelling errors students receive an evaluation of their orthographic skills. The five categories in which most

of the spelling mistakes were made are displayed in a pie chart, as shown in Figure 9. Different categories are represented by different colors allowing the student to grasp the main areas of spelling mistakes intuitively. Teachers are provided with the same evaluation for each student. Additionally, teachers receive an evaluation of the orthographic skills of the whole class which is displayed in form of a similar pie chart.

These two evaluations allow the teacher to focus on the main orthographic difficulties of their class at any given time throughout the lesson. When teaching the whole class teachers can base their methods on their knowledge of the difficulties in orthography of the entire class. Working individually during a lesson each student is able to work on his or her struggles with orthography. On basis of the evaluation, remedial teaching can be planned and executed effectively, for example, by constructing groups of students experiencing the same difficulties in the same areas of German orthography.

### *Reaction training materials*

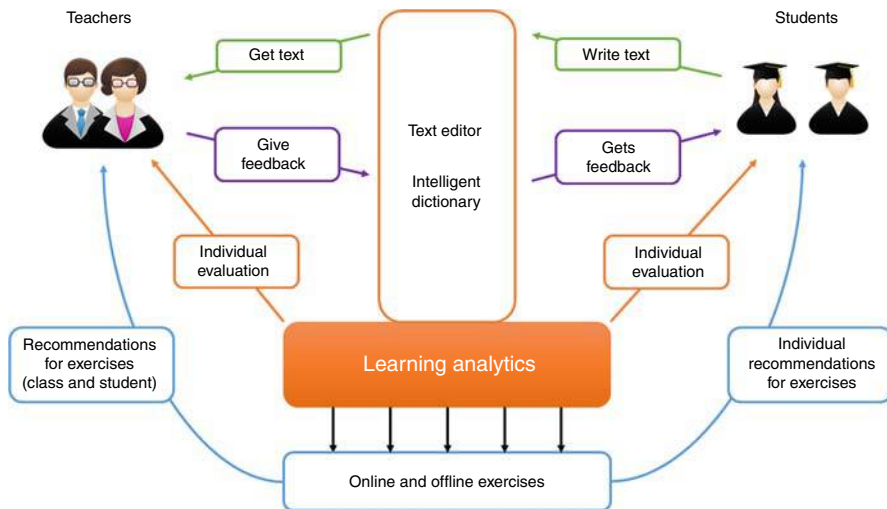
Below the depiction of the evaluation links to individual training materials on the basis of the analysis is provided. These materials consist of online and print exercises alike. Besides, online courses on individual phenomena of German orthography can be accessed by the student offering a rather intensive training including explanations and various exercises. This is the last stage of the circular flow encompassing the entry of the text, the text analysis and correction, the evaluation and the follow-up exercises. In conclusion, a repeated looping of the circular flow consequently leads to a continuous increase in the orthographic performance of the student.

### **Conclusion**

IDeRBlog offers students a unique blending of blogging and various opportunities to improve their orthographic skills. While the writing and working with the “intelligent dictionary” can be considered as the core function of the website it is enriched by a vast amount of print and online exercises as well as courses on various orthographic phenomena. From the perspective of LA IDeRBlog offers an exclusive insight into the acquisition and improvement of orthographic skills. Figure 10 shows, the holistic approach and the integration of LA in the whole process. Individual evaluations are provided to each text as well as recommendations for exercises. In comparison to studies on orthography, IDeRBlog benefits from a large number of users and hence it has the advantage of exceptionally huge sample of student’s texts and spelling mistakes. Analyzing and evaluating the data are assumed to uncover new aspects of the learning process.



**Figure 9.**  
The top 5 error categories from the student are presented with a pie chart



**Figure 10.**  
The holistic approach  
with LA integration

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