

Revisiting the Computer as Informant from a Teacher-Mediated Perspective: Suggested Implementation of an Automated Language Diagnostics Tool

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Abstract

This article argues for considering a shift in focus towards teacher-mediated tools in English as an Additional Language (EAL) teaching. The argument is primarily carried by previous research within Data-Driven Learning (DDL) and Second Language Acquisition (SLA). A tool currently being developed as a part of an ongoing dissertation project in collaboration with EAL teachers is used to showcase how such an implementation could look, and respondent drawings collected as a part of that project are used to fit the implementation within the routines of a small sample of practicing EAL teachers at the upper-secondary level in Sweden (n=4). The results indicate that teacher-mediated data-driven tools could work within theoretical frameworks of corrective feedback, language learning models and suggested routines of practice, but also highlight that much more research is needed before a wider implementation is considered.

Keywords: Second Language Acquisition (SLA); L2 writing; corrective feedback; English as an Additional Language (EAL); feedback routines

1. Introduction

This article argues for consideration of a shift towards teacher-mediated solutions in our approach to the implementation of Data-Driven Learning (DDL) tools in English as an Additional Language (EAL). Data-driven instruction (DDI) has previously been used to describe similar conceptualizations, albeit on an organizational level (Halverson et al. 2007). The shift from learner-centered implementation towards teacher-mediated implementation is argued for with a basis in previous research on corrective feedback at the intersection of Second Language Acquisition (SLA) and second language writing (L2 Writing) (Ferris 1999, 2004, 2010).

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DDL has been a mainly learner-centered endeavour since the 1980s (Davies 2016), with many research efforts focusing on corpus consultation-type exercises within the classroom as the main venue for application (Johns 2002; Boulton 2010). A corpus consultation-type exercise as a learner-centered activity would, in most cases, involve learners being introduced to the corpus and interacting with it in order to explore features such as word formations, sentence structures and idiomatic expressions. There have also been activities focusing on error correction, although these have also consisted of learners engaging directly with corpora under guidance (Crosthwaite, Storch and Schweinberger 2020).

While previously being utilized mainly in tertiary education (Estling Vannestål and Lindquist 2007; Boulton and Cobb 2017; Crosthwaite 2017), these types of activities have also been explored in primary and secondary education (Römer 2011; Boulton and Cobb 2017; Karlsen and Monsen 2020). In this article, I will argue for a teacher-mediated approach to implementing data-driven corpus methodologies in the EAL classroom by revisiting Johns' (1991) conceptualization of the computer as an informant, with the computer acting as an informant to the teacher.

In order to facilitate this teacher-mediated response to students' written production, a digital tool was built based on specifications gathered through semi-structured interviews.¹ The interviews focused on teachers' feedback routines and interactions with student texts, with emphasis on areas that were often subject to feedback on form. The interviews were conducted during an on-going dissertation project, which deals with the contextualization, design and implementation of the same teacher-mediated tool. This article deals mainly with the implementation of the tool based on previous research, but the interview results will be discussed briefly as they influenced the form of the tool through participatory design.

The aim of the tool is to provide teachers with the ability to create a dynamic corpus of student texts, perform error analysis and create a summary for planning and formative assessment. With the computer as informant, implementations of DDI closer to the classroom setting can start to be considered as a combination of elements from DDL and DDI, depending on how the teachers include the results in their practice. The

¹ A beta version of the tool is available from the author or via <https://github.com/DanielIhrmark/dissertationsoftware>.

teachers' access to data-driven support in planning, applying and evaluating responses to student performance has been shown to be experienced as beneficial (Davis Bianco 2010).

The specific research questions for this study are:

1. What are the routines surrounding text interactions suggested by a small set of Swedish EAL teachers?
2. Is there a framework that fits these routines and allows for comparisons across implementations in SLA and L2 writing?
3. How would the tool fit within the routines and framework?

2. Background: Language learning, computers, and corrective feedback

This article takes a sociocultural perspective on language learning (Vygotsky 1986), and the suggested implementation is based on Vygotsky's concept of the Zone of Proximal Development (ZPD) and the concept of scaffolding as set out by Wood, Bruner and Ross (1976). More precisely, the theorized implementation will explore how a teacher-mediated tool could support contingent scaffolding for language development through lesson and exercise planning (van de Pol, Volman and Beishuizen 2010; Wood and Wood 1996).

The sociocultural model of second language acquisition stems from the idea that language and knowledge are constructed socially, and combines the cognitive perspective on knowledge attainment (Piaget 1952) with the emphasis on social interactions as the main mode of acquiring knowledge (Vygotsky 1986). The model describes the learner developing their knowledge through interactions with others, themselves and their surroundings. This development depends on the correct level of input from the interaction, where the learner has the capacity to understand enough of the situation to bridge the gap to the new information. This is referred to as the Zone of Proximal Development (ZPD), which is the appropriate amount of new knowledge for the learner to develop (Vygotsky 1986).

The concept of the ZPD was brought into SLA through the Interaction Hypothesis (Long 1980). According to this hypothesis, the language input for the learner can be modified through slowed down speech, comprehension checks, clarification requests and requests for repair. This is where scaffolding as an intentional supporting structure for learners in SLA comes into play (Wood, Bruner and Ross 1976).

The term *scaffolding* was lifted from construction work by Wood, Bruner and Ross (1976), and refers to how a learner is supported in order to bridge the ZPD. Much like scaffolds in construction, the intention is that the building, i.e., the acquired knowledge, will remain structurally sound when the supports are removed. In SLA, scaffolding can be seen in relation to the Interaction Hypothesis by viewing Long's (1980) modified interactions as scaffolding. However, this would put the focus on synchronous scaffolding occurring during the language exchange, whereas the area of interest for this study is asynchronous scaffolding as it relates to texts and feedback.

The concept of contingent scaffolding in the classroom setting was initially introduced in the form of contingent tutoring, which described how children were tutored by their mother when learning new information (Wood and Middleton 1975). The beneficial outcome of interactions surrounding learning was found to depend on two rules: 'if the child succeeds, offer less help; if s/he gets into trouble, offer more help' (Wood and Wood 1996: 391).

The idea of the tutoring relationship operating on a basis of contingency was further explored by dividing the concept into instructional contingency, domain contingency and temporal contingency (Wood and Wood 1996: 392). Instructional contingency relies on the two rules presented above, with domain contingency referring to tutoring provided in accordance with the goals set by the learner and temporal contingency being the appropriate timing of support within the learning experience. The implementation suggested in this article will aim at supporting the teacher in scaffolding their learners by identifying areas of intervention according to instructional contingency, and timing of interventions according to temporal contingency. This should not be seen as disregarding the importance of domain contingency, but rather as an acknowledgment of the limitations of automated diagnostic tools. Understanding the goals set by the learners themselves should be regarded as a part of the teacher's interpersonal expertise, and not as something that could be made part of a digital analysis in a meaningful way.

In order to achieve a functioning instructional contingency, the learner's attention must be directed to what is causing them trouble. In the context of DDL, the Noticing hypothesis (Schmidt 1990) is discussed as a viable solution by Flowerdew (2015). The hypothesis suggests that a learner will, in some situations, need to pay deliberate attention to certain

patterns in order to acquire them. In corpus-consultation approaches to DDL this has taken the form of learners noticing differences between the language they produce and the language they encounter through the corpus. Scenarios where the attention is directed towards specific patterns by the teacher have been referred to as ‘pedagogic mediation’ (Johns 1991), and can serve as important scaffolds for learners to start noticing features of their language use (Flowerdew 2015). In Flowerdew’s discussion, focus is on DDL applications that directly interact with learners, but the points raised are also important for the teacher-mediated tool, as the use of the tool would support teachers in decisions about where to direct their learners’ attention.

A 2010 overview of scaffolding indicated that contingent scaffolding had become a more popular approach in research, and was found under descriptors such as ‘responsiveness, tailored, adjusted, differentiated, titrated, or calibrated support’ (van de Pol, Volman and Beishuizen 2010: 4). The main tool in contingency was indicated to be the use of diagnostic strategies that allowed the teacher to assess what the appropriate level of support would be, and thus adapt their scaffolding strategies in accordance with the learners’ level. A second feature indicated as central was contingent fading, which refers to the transfer of responsibility from the teacher to the learner (van de Pol, Volman and Beishuizen 2010: 5). Contingent fading can be performed over several tasks, which entails transferring more and more of the responsibility to the learner as the teaching progresses. As this transfer takes place, domain contingency will increase in importance as learners set their own goals to a further extent.

Returning to Flowerdew’s overview of language learning theories in DDL, examples of sociocultural approaches are lifted as frameworks for group assignments where students are matched so as to provide support for each other’s development (2015: 27). This also highlights where a supporting tool for the teacher could come into play as the overview diagnostics provided by automated error annotation could support conscious matching of learners that can scaffold each other on the specific patterns found for each individual.

2.1 Data-Driven Learning and instruction in EAL

In the context of this study, DDL is used as a sub-categorization of Computer Assisted Language Learning (CALL), namely Explorative CALL (Davies 2016). The distinctions from previous CALL approaches

were the move from call-and-response type drills and curated multimedia collections with prepared exercises towards learner-centered automated language analysis (Davies 2016). Explorative CALL developed towards DDL as the practice moved on towards the creation of data intended to guide the learning environment (Johns 1991). While DDL has since moved towards corpus-consultation type implementations, where learners are guided through the use of a corpus themselves, the implementation suggested here makes use of the language analysis aspect of Explorative CALL, but supplies the teacher with the results of analysis conducted on student texts in order for them to mediate the learning experience based on the data. This shift towards what could be considered DDI is now discussed against a background in previous research on DDL.

Automated error correction was already around at the time *Computer-assisted Lessons in French* (CLEF) was brought onto the market by CamSoft during the 1980s (Davies 2012). However, the system within these early applications relied on a carefully crafted set of questions and exercises that allowed the program to compare answers to a prepared list of structures in order to identify errors in the response and provide a feedback message. Another issue found with learner-centered applications is the mode of language production required from the learner, as their output, being entirely made up of fill-the-gap type exercises, or in some cases being an entirely mouse-driven experience, is very different from actual language production (Chapelle 1997).

The issues highlighted by Chapelle (1997, 2003) could be seen as stemming from the way the computer is situated within Explorative CALL and DDL. Johns conceptualizes the computer as an ‘informant’, as opposed to a ‘surrogate tutor’ (1991: 1). Johns’ discussion of the topic touches on the contemporary issues with language analysis software, summarizing the situation as the machine not being able to ‘carry out as apparently simple an “informant” task as correcting the English of a piece of student writing’ (1991: 2). A lot of things have happened since 1991, and the analysis software at our disposal today allows for Johns’ solution of having computers analyze longer pieces of student writing. In essence, a teacher-mediated tool could let assignments focus on language use-cases without letting the needs of a computational diagnostic solution dictate the assignment design.

The solution suggested in the current study is to shift the focus from learner-centered towards explicitly teacher-mediated solutions. In practice

this would mean limiting the initial use of implementations to the teacher. My argument for this as a way forwards hinges on the educational context being diverse and complex, meaning that the data behind a data-driven solution should be mediated by a teacher, unless used for exploration of the target language.

The teacher is responsible for the planning, curation and evaluation of their lesson plans and classroom activities, and is in a position where it would make sense to implement a data-driven approach. Local learner corpora have previously been highlighted as a way forward for using corpora as a part of language pedagogy (Mukherjee 2006), but their placement within teacher education as a non-necessary bonus topic has led many trainee teachers to deprioritize their use in favor of topics more essential to earning their degree and certification (Boulton 2010), or avoiding them due to beliefs regarding the student group's ability to benefit from them (Karlsen and Monsen 2020).

The shift in target audience means that technology can be constructed to fulfill not a pedagogical or didactic role, but a role of informing a trained professional about the data relevant to their subject along the original intent and function of corpus linguistic analysis.² At this point, the demands of the technology used are no longer dictating the teaching design, but the technology is instead explicitly crafted to highlight patterning and descriptive statistics for the benefit of the teacher in their evaluation of said design.

Regarding the complexity of the educational context, the more complex and advanced aggregate data created by the analysis of a longer piece of student writing is likely to be too dense for a learner to gain much from being presented with it, and, while Sauro (2009) notes that such implementations could be seen as beneficial, Ferris' overviews of corrective feedback in SLA indicate that such a wide and unfiltered mass of written feedback is likely to demotivate the learner and give rise to avoidance issues in their production, in addition to causing distress (Ferris 1995, 1997, 2010). However, for the teacher, the overview can be sorted and filtered for lesson planning or for exercises that concern individual students in accordance with the teacher's pedagogical and didactic judgement.

² This was pointed out to me by a reviewer, and I wanted to include it as it adds to the argument. However, I cannot take credit for making the connection.

The approach so far is in line with what O’Keeffe notes as the positionality of DDL in sociocultural approaches (2021). The interaction around data is moved away from a learner interacting with data independently towards a supportive approach where the teacher actively mediates the interaction with data in order for the learning experience to be enhanced by it (O’Keeffe 2021). O’Keeffe argues for a broader gaze in DDL research, and refers to things such as screen capturing and eye-tracking as ways of exploring how learners interact with DDL resources. These things are equally important for the teacher-mediated tool discussed in this article, as the target of the teacher’s focus on different aspects of the overview provided is likely to influence what is passed on to the learners.

The teacher’s professional judgement is a central component to my argument here, as it is a central component to any successful solution in the educational context. Boulton (2010: 3–4) argues that in order for corpus-based approaches to start seeing use in classrooms, they must be normalized and demystified, and showcased as a natural part of teaching practice. As I argue in this article for the explicit inclusion of DDL and DDI applications in the teachers’ practice, arguing for their inclusion in teacher training programs is a given. This also highlights an issue to anticipate with such an inclusion: fit with language acquisition models and within current routines.

This article contains a suggested implementation along the sociocultural model of SLA and Ferris’ model for corrective feedback (2010). However, the most important context in which an application must be made to fit is the routines and practices of practicing EAL teachers, represented by a small survey in this study. A technological solution that does not fit into the realities of the teaching profession is not likely to see any use, regardless of inclusion in teacher training or being explicitly designed for use by teachers.

2.2. Ferris’ model of corrective feedback

The idea of corrective feedback concerning grammar in SLA and L2 writing is not entirely uncontroversial, despite being a part of most upper-secondary language education to some extent. Ferris’ research on how exactly corrective feedback could be used for the benefit of the learners traces the development of our understanding of the concept and arrives at a set of criteria for beneficial corrective feedback, as well as an experiment

design that allows future studies on the topic to act in connection with research from both the SLA and L2 writing fields (Ferris 1995, 1997, 1999, 2004, 2010). Both the feedback and the experiment design rely on learners performing revisions and editing their own texts.

The criteria presented for successfully implementing corrective feedback are: '(1) That students are focused on the importance of editing, (2) are trained to identify and correct *patterns* of frequent and serious errors and (3) have been given explicit teaching on the grammatical rules relevant for those errors' (Ferris 1999: 5). Facilitating a classroom environment where learners can focus on their revision is key to feedback having the desired effect, as is scaffolding the students so that they can develop the practices needed to perform those edits after receiving feedback and instructions. While the application presented in this article can only provide information on errors in text production, enabling the teacher to access data on the patterns, frequencies and types of error ties directly into satisfying Ferris' second and third criteria. Even if the teacher does not communicate the analysis to the learners directly, the automated analysis can highlight patterns of interest for the teachers and indicate which areas are most relevant for the group or individual.

As for the learner experience, if the criteria are fulfilled and the teacher has the opportunity to facilitate the experience accordingly, learners were found likely to attend to patterns highlighted and appreciate the feedback (Ferris 2004). Based on her research overview, Ferris also found it likely that the learners who receive corrective feedback according to the model will develop a higher uptake and benefit long term, as the focus on self-revision and editing will enable them to continue their development without the teacher's aid once their education is concluded (Ferris 2004: 56).

In order to carry out corrective feedback in accordance with the criteria proposed by Ferris, teachers need to perform deep readings of student texts, index grammatical errors and spend time preparing lessons and feedback in accordance with their findings. The problems arising from this are summarized by Ferris as being the time, energy and expertise available to the teacher in their practice (Ferris 2010: 193). As such, this is an area where teacher-mediated tools stand out as a solution, as they could alleviate these issues and allow Ferris' model to be adapted to teaching practice.

The experiment design proposed by Ferris (2010) differs from the design commonly used in SLA and L2 writing research, as neither of the commonly found design archetypes corresponds with Ferris' previously presented criteria. The typical L2 writing design identified by Ferris (2010) includes the student writing a text, feedback from the teacher, and then a revision of the same text. The typical SLA design includes the same two initial steps, but the student then writes a new text instead of revising the initial production. The new design being proposed by Ferris (2010) blends these two together so that the steps taken are:

1. Student writes a text
2. Teacher provides feedback
3. Student revises text
4. Student writes new text

Why is this experiment design important for a suggested DDL implementation in classrooms? Partially this is due to the previously mentioned comparative aspect when the implementation is brought into the context of previous (and future) research on corrective feedback in SLA and L2 writing, but it also reflects the steps in Ferris' model and acts as a guide to good practice because of it. Feedback and assessment can also be provided between step 3 and 4, but the point argued by Ferris (2010) has to do with the lack of longitudinal perspectives in SLA research. The model presented by Ferris (2010) is intended to be considered a parallel to pre/post-tests in other experiment designs, where the new text would take the position of a post-test to see how retention of acquired patterns has worked out. As pointed out by Ferris (2010) in footnote 8, 'in real-world writing instruction, genre and task-type considerations can and should vary from one assignment to the next, which makes such longitudinal comparisons more difficult'.

Bringing the idea of contingent scaffolding into this design, and with Ferris' criteria in mind, the second step becomes the focal point. It is important to note that step four could, in a classroom cycle, be considered the first step of the next writing assignment. However, the main point of step four is the assessment of the influence of step three (and feedback on step three if it is given), as well as other activities that have taken place between the initial and second text submission. The second step would also be the main diagnostic activity, and would play an important role in enacting contingent scaffolding in accordance with van de Pol, Volman and Beishuizen (2010).

Corpus-consultation tasks focused on feedback and error correction have been shown to run into criteria demands similar to the ones described by Ferris (2010), such as devising appropriate feedback and focusing on corrections that match well with how the students are intended to engage with them (Crosthwaite 2017). Crosthwaite (2017) also indicated that certain types of corrections were considered more appropriate for DDL using guided corpus-consultation by the learners. This was further shown in a later study by Crosthwaite, Storch and Schweingberger (2020), which emphasized the importance of appropriateness in correction selection in order for corpus-consultation type tasks to provide beneficial results.

3. Methodology: Respondent descriptions of routines and feedback

The methods used for data collection were semi-structured interviews in combination with a respondent drawing, which was intended to support teachers in describing their routines by visualizing them as a basis for discussion (Kvale 2013; Guillemin 2004). The respondent drawing was included in order to make interaction patterns between teacher, student and student text explicit. The interviews were conducted in 2019 and 2020, and the respondents were practicing upper-secondary level EAL subject teachers. The interviews dealt with identifying points that required feedback from the teachers as a basis for the tool design, as well as questions regarding their routines surrounding student papers and giving feedback visualized through the respondent drawing. This will be the data used to model the implementation presented in the current study. Interview questions related to routines were asked while the drawing was produced; these can be found in the Appendix.

The interviews were carried out in three iterations, and the respondent drawings presented in this article were all produced during the final set of interviews. The first two sets consisted of three teachers each, and were used to refine the interview instrument. The final set of participants consisted of four teachers with between one and four years of experience teaching the English language subject at upper-secondary level. As such, the respondents for this study should not be seen as a generalizable representation of Swedish EAL teachers, but rather as an effort to include actual teachers in the development of an application and its intended implementation as a way of remaining practice-oriented.

Sampling for the study was convenience-based and relied on the author's professional and personal network (Bryman 2012). Recruitment

took place through inquiring for participants via social media and through personal contacts. The initial sampling plan was to inquire about participants from schools local to the author's place of employment, but due to the COVID-19 outbreak this approach did not yield results. The sampling instead came to incorporate teachers from multiple municipalities in southern Sweden, who were recruited through previous contacts with the author either through the teacher training program, mutual friends or through having previously worked at the same school.

This type of recruitment is likely to have introduced a bias to the sample. The participants recruited this way were all between 25-35 years of age and were interested in the development of digital tools, which is likely to have biased their evaluation of the possibilities given by such a solution. They were all teaching English subject courses within the upper-secondary system at the time of the interviews, and were all licensed for the English subject. The municipalities all follow the national course plan for the English language subject, and do not have local policies that would influence the shape of the teaching more than it would differ between separate schools within the same municipality.

Written informed consent was collected before interviews were conducted, and storage of recording and transcripts follows the guidelines set by the Swedish Research Council's code of ethics (Vetenskapsrådet 2019). The interview guide was also submitted to the Ethics Review Authority as a part of the dissertation project. The resulting ethics review stated that the project did not contain content subject to ethical approval.

3.1 Data

The respondent drawing made use of a template which included two human silhouettes, based on the silhouettes used by the *Spracherleben* research group's language portraits (Busch 2012) and a stencil representing a non-branded computer (see Figure 1). Initially, the drawing was intended for use with pencil, but due to COVID-19 the interviews were done via Zoom and a shared browser whiteboard was used instead. The interviews took between 35 and 40 minutes, and were recorded on a dictaphone for later transcription. The participants were interviewed individually by the author. As there was no video recording, the respondent drawings are only available in their finalized form. This is an important aspect of the data collection as it provided the respondent agency over their drawing and leaves the submitted form up to them.

The respondent drawing is intended to allow interviewees to visualize their experience and provide a focal point for the discussion, while also making patterns across participants stand out. The use of a template is intended to reduce the barrier of engagement with the activity, as well as reducing performance-based anxiety regarding the production of the visualization (Meyer 1991).

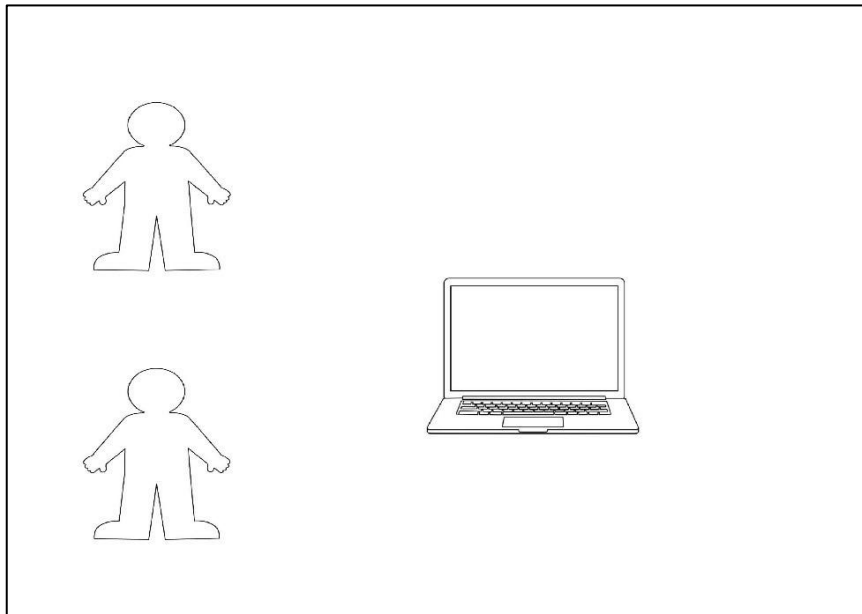


Figure 1. Template used for participant drawing

The respondent drawing template was introduced at the beginning of the interview, and participants were told that it would later be used to discuss their workflow with student texts. In addition, the participants were explicitly told that they were allowed to use the template for taking notes or drawing during the rest of the interview as well. Their attention was redirected to the drawing once the interview moved on to the categories dealing with feedback routines and digital experiences. As these were the two final segments of the interview, the drawing could be used as a way of summarizing the discussion up to that point, and references could be made to earlier statements when discussing the pattern.

The interview segments on feedback routines and digital tools concerned two perspectives: what the teachers were doing currently and what they would like to do if they had the opportunity. Category three had questions regarding routines and feedback when interacting with texts produced by students, while category four contained questions regarding experiences with digital tools. These are both included in the data for the current study as the influence of digital tools and solutions cannot be clearly distinguished from the routines as described, and because these segments of the interviews were conducted while the teachers were engaging with the respondent drawing.³ A compilation tracing of the respondent drawings can be seen below in Figure 2.

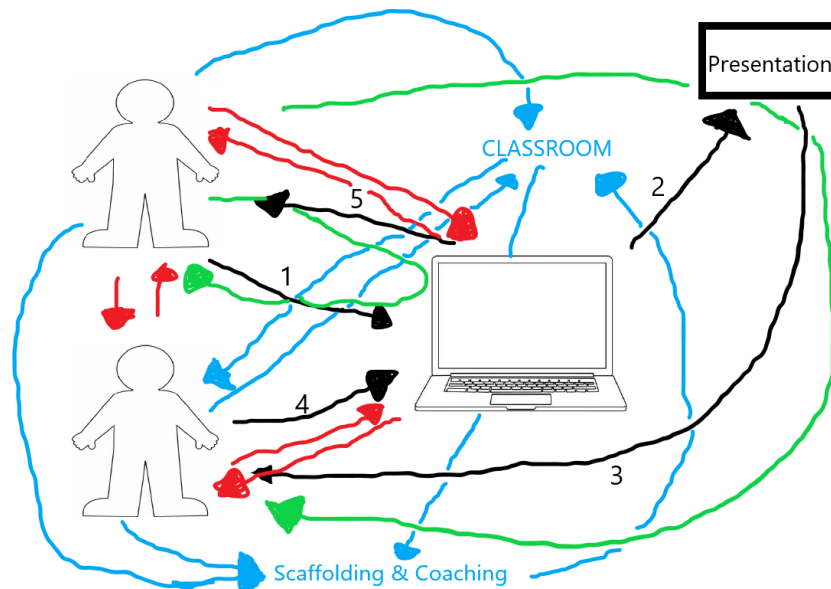


Figure 2. Compilation drawing of patterns in respondent drawings (individual respondents traced onto one template and identified via color)

³ The results of the questions included in the interview segments are not mentioned in this article, but are discussed in the full dissertation. They have been included here for completion as they provide context for the drawings.

The respondent represented by the black lines numbered their lines as a way of including concrete activities. The numbering corresponds to (1) teacher reads and provides comments, (2) recurring issues on a group level are addressed through a classroom presentation/activity, (3) students revise according to individual comments and group presentation/activity, (4) students resubmit revised texts, (5) final version submitted online. The respondent in green describes a similarly cyclical process, but does not separate between group level and individual level. Feedback is instead provided through in-text comments.

The respondent in red described a bi-directional system of interactions that relied on specific digital solutions, such as Teams, e-mail and plagiarism detection software. The process remains cyclical, with students receiving in-text comments and common group-level errors being included in the lesson planning. The respondent reads the texts continuously throughout the writing process, and plans their classroom grouping in such a way that students are paired with each other based on their understanding of different rules and patterns. This is intended to stimulate beneficial interactions within the group. As the students develop, the respondent becomes more hands-off, and does not intervene as much during the writing process.

The respondent represented by the blue lines describes a process similar to the one represented by black lines. However, scaffolding and coaching are explicitly mentioned as a category of interactions where they actively support their students, such as topic research, drafting and revisions. These things take place in the classroom setting, which allows the teacher to dynamically interact both at the group and individual level.

As Ferris (2010) predicted, deviations from the feedback routines desired by the teachers, such as individual oral feedback and one-on-one interactions, were motivated by the amount of time given to the teaching practice during a work day and the energy available for engaging with student texts after classroom teaching had been completed. Additionally, the number of students in each class was brought up as a limiting factor. More opportunities for one-on-one feedback interactions face-to-face were mentioned as desirable by multiple respondents, but were not applicable in practice due to time constraints. A split in feedback where features identified as beneficial for the entire group were made a part of classroom teaching while individual exercises for each student were applied was also mentioned as desirable. However, these were found

difficult to implement on a regular basis due to the time needed to create the activities for individual students as well as the amount of engagement with texts needed to create well-informed lesson plans based on student production.

The routines surrounding feedback on text, as desired by the teachers, fit well with what Ferris (2010) describes. The main obstacles on the road to implementing these practices, also as described by Ferris, sadly, are the energy and time available. The desired feedback routines described also fit well with contingent scaffolding, but in order to adhere to instructional and temporal contingencies time needs to be allotted to close diagnostic readings of the student texts, which was rarely possible.

4. Fit of tool within respondent routines

Before moving on to the implementation, a small outline of the tool together with a description of the intended fit within the respondent routines will be presented. The main focus of the current study is the implementation approach, and the tool description is included for the sake of completion. However, proper implementation should rely on an understanding of the actual tool to be used, as well as the practice into which it is intended to fit.

The tool created for the dissertation project is a language analytics suite with a graphical user interface. The problem the tool is intended to solve is the workload experienced by teachers when performing deep reading of student texts. As previously mentioned, the workload and time requirements connected to such analysis are likely to cause teachers not to engage in them. This is especially highlighted by Ferris (2010), and the tool is aimed at making implementation of her model a practical possibility for the teachers.

The analytical functions of the tool are built on Python libraries meant for corpus linguistics, such as NLTK, and libraries built for error annotation and text analytics, such as Java LanguageTool and TextStat. The interface makes use of a basic TKinter interface for document selection and a Dash browser dashboard for interacting with the aggregate data. The interface and dashboard are the main novelties of the tool, as they allow teachers access to the analytical functions and provide a visualized overview of the results intended for feedback and planning purposes.

Student texts are uploaded via the TKinter interface and analyzed for baseline data, for instance word count, sentence length and lexical density, and are automatically annotated for language errors based on the Java LanguageTool pattern lexicon.⁴ The language error annotations are summarized according to their categories and aggregate data for the individual documents is created. This data is then made available to the user through visualizations in the dashboard, and can be saved to the user's computer in spreadsheet format.

Drawing on the routines described by the respondents, the application is intended to fit into the steps containing diagnostic readings of the learners' written production. According to the interviews and respondent drawings, such steps are undertaken for three reasons: assessment, feedback and planning. Feedback is taken here to relate mainly to individual interventions and comments, while planning refers to group-level activities and presentations.

The tool is not intended for summative assessment, as the metrics provided to the teacher do not relate to the national content of the English subject in an explicit manner, nor have the assessment guidelines provided by the Swedish syllabus been taken into account during the design. The intention has instead been to create a support tool for formative assessment. For these reasons, grading and assessment are not considered as viable steps for implementation of the application.

Planning, as described by the respondents, can be conducted based on aggregate data for the texts on a group level. Quantitative overviews are a very good fit for such an approach and the frequency listing of the error annotations in combination with the number of texts in which they appear would clearly indicate which patterns are of interest for lesson plans. The use of an automated approach would also make it possible to iteratively adapt teaching to drafts sufficiently quickly for lessons to influence the next submission of the same text.

Individual feedback will also benefit from the teacher having access to quantitative overviews, although perhaps mainly as a way of highlighting individual development. In addition, since the error annotations for an individual document can be extracted as a spreadsheet, individualized exercises can be created and distributed in close connection

⁴ The full list of error patterns is found at <https://community.languagetool.org/rule/list?lang=en>.

to the initial submission. While not directly connected to the use of the application, the use of an automated solution could also allow the teacher more time for one-on-one interactions as a way of providing feedback.

In summary, partial automation fits well with the limited description of practicing teachers' routines regarding text and feedback provided in the current study. While grading has been left out, its intended function differs from the nature of the type of diagnostics discussed here. The main aim here is to benefit language acquisition and language development through support and data-driven interventions, not grading the production. With the fit of the tool situated in the practice described, I now move on to situating the implementation of the tool in the intersection of routines and previous research.

5. Suggested implementation

The suggested implementation is based on the actions the teacher is encouraged to perform according to the previous research and models, combined with the routines and feedback practices described by the respondents. In order to depict a teacher-centered implementation, these actions create the backbone of how the application can be utilized.

Combining the pattern of actions from the respondents with Ferris' (2010) model, a template for the implementation can be created (see implementation plan below). As mentioned in connection to the description of Ferris' model, the series of actions is concluded with the creation of a new text, which is where language development can be seen. In the combined series below, assessment is included as it is needed in the school setting, but this should be seen as a separate act.

Implementation plan:

1. Students write about and submit text
2. Teacher engages with text through tool
3. Issues on a group level are addressed through classroom activities
4. Issues on an individual level are addressed through comments and exercises
5. Students revise according to individual comments, exercises and classroom presentation/activity
6. Students resubmit revised texts
7. Text is assessed and steps 3–4 are repeated if possible
8. Students write new text

The second step in the series above becomes the initial point of the DDL implementation, as this is where the teacher first engages with the text. Once the texts are submitted to the teacher, they can be put through the application and the data is generated. However, following the information from the red and blue respondents, scaffolding interactions are also likely to take place during the first step in cases where writing takes place in the classroom.

Once the application has been run, the teacher can separate the output into group-level issues, which are frequent across multiple texts, and individual-level issues, which are frequent in fewer texts. As the group progresses, the efficiency of group-level instruction can be evaluated and the response can be altered as the teacher sees fit.

The main point of the tool is to provide data for decision-making, and the emphasis must still be on the teacher's skillset in order for the decisions made to be correct. Since the implementation allows the teacher to be data-driven in their efforts, the identification of contingency parameters, i.e., language level and specific areas causing issues, can be conducted across multiple drafts and in close temporal connection to the text being written. The access to the data provided by the tool will also allow the teacher to present curated data and visualizations to the students.

By allowing the teacher to take center stage during the implementation, the data can support decisions about what to include in the curated exercises derived from the error annotations (step 2) and what to create lesson plans around (step 3), while also paying attention to the needs of the individual students (step 4) in order to not overwhelm them. This final note is exceptionally important as it is directly connected to the idea of temporal contingency.

Through teacher-led re-engagement with their texts (step 5), learners can also be scaffolded towards acquiring the necessary skills for corrective feedback to become beneficial, indicated by Ferris as being '[...] that students are focused on the importance of editing, [...] are trained to identify and correct *patterns* of frequent and serious errors and [...] have been given explicit teaching on the grammatical rules relevant for those errors' (Ferris 1999: 5). The final item in the quote is not an acquired skill amongst the learners, but is rather supplied by the teacher through comments, individual exercises, teaching materials and classroom activities.

The use of multiple information channels (comments, individual exercises, classroom presentations) is also likely to benefit the learners' uptake, as one channel might be preferred by individual students. The final submission of texts (step 6) will, from the perspective of Ferris' model and the scaffolding structure, create a point where the learners move on to create a new text and can apply their new knowledge in the creation of new writing.

Returning to Ferris' model, the initial submission of a new text after the implementation should serve as the teachers' main point of assessment of the learners' development, as it has been produced without scaffolding and could be considered representative of their level. The data acquired from this new text should highlight changes relevant for instructional contingent scaffolding, as issues that persist at high frequencies in the new text would require continued engagement ('if s/he gets into trouble, offer more help'), while errors that have become infrequent might only require a reminder ('if the child succeeds, offer less help') (Wood and Wood 1996: 391). Extra attention must be given to individual texts retaining high frequencies of error patterns engaged with during the previous cycle, as these individuals might require a different kind of engagement.

Contingent fading, or the transfer of responsibility, ties into learners acquiring, over time, the ability to produce and revise texts independently, and should be considered the end goal of the teacher's task. As a teacher-mediated approach, the tool can indicate the appropriate level of responsibility for the learner through shown proficiency, but as meta-cognitive abilities and many other things come into play when discussing a learner's ability to independently create texts, the assessment of when to fade, and to which degree, is something I feel is better left to the non-data-driven judgement of the teacher. While this article has focused on fitting the tool within theoretical models and teacher routines, the influence of the tool on these relational aspects of teaching is something that must be explored much more thoroughly before any recommendation regarding free implementation without a research purpose can be made.⁵

⁵ A small-scale pilot test has been conducted for one semester during 2022 by the author as a part of the dissertation project, but larger samples and longer testing periods are needed. Anyone interested in testing the tool themselves or conducting their own research using it are very welcome to contact the author for access or more information.

6. Conclusion

By shifting the implementation of tools in upper-secondary schooling from learner-centered applications towards teacher-mediated supporting tools, some of the previously highlighted difficulties with DDL implementations can be avoided. Within EAL, there is cause to believe that a teacher-mediated implementation will create the prerequisites needed for teachers to implement what current research indicates is best practice for corrective feedback on student texts within their existing routines. This would, however, have to be confirmed by a larger sample before anything can be stated with certainty.

The tool and implementation suggested in this article also seems to fit with Ferris' (2010) model for experiments on corrective feedback, which means that future research could be compared to results from previous research using the same model. In addition, future research using the same model for corrective feedback could also explore how the teacher's focus on different aspects of the analysis would influence the resulting teaching.

Future research into implementations within EAL can also be used to explore models such as Ferris' in a classroom setting in order to further specify how they could be operationalized when supported by automated error annotation. The automated error annotation looks promising when considered as a solution to some of the issues highlighted by Ferris, such as workload and time constraints, but this must also be confirmed by further piloting. As seen in Crosthwaite, Storch and Schweinberger (2020), certain corrections were experienced as more appropriate for DDL than others. Future research would also have to explore if this is the case for the teacher-mediated approach suggested in this article, and consider whether or not this should influence the design of the tool.

Appendix: Interview Questions

Category 3: Routines and Feedback

1. Har de språkliga svårigheter du hittar i elevers texter någon inverkan på din grammatikundervisning?
(Do the language issues you find in your students' texts influence your grammar teaching?)
2. Vilken form brukar den återkoppling dina elever får på sina skriftliga uppgifter ha?

- (Which type of feedback do you provide on your students' written assignments?)
3. Hur skulle du beskriva ditt arbetssätt med elevtexter från inlämning till återkoppling?
(How would you describe your workflow with student texts from submission to feedback?)
 4. Finns det rutiner för att hjälpa elever som har återkommande svårigheter i engelska på din arbetsplats, eller på några av dina tidigare arbetsplatser?
(Are there routines to help students experiencing recurring difficulties in English at your place of employment, or at any previous place of employment?)
 5. Vad brukar du ge feedback på vad gäller språket?
(What do you normally provide feedback on regarding language use?)
 6. Om du inte hade några begränsningar vad gäller tid och resurser, hur hade du velat ge återkoppling till dina elever?
(If you had no constraints in terms of time and resources, how would you have liked to provide feedback for your students?)

Category 4: Digital Experiences and Tools

7. Använder ni någon form av digital plattform, och hur funkar den?
(Do you use any type of digital platform, and how does it work?)
8. Hur fungerar elevinlämningar på den plattformen?
(How do student submissions work on that platform?)
9. Känner du dig bekväm med det/de digitala stöd du har tillgängligt?
(Do you feel comfortable with the digital resources at your disposal?)
10. Använder du någon form av digitala verktyg eller stöd i din undervisning eller feedback?
(Do you use any form of digital tools or supports in your teaching or feedback?)
11. Har du använt någon form av digital språk-korrigerings? (Word, Grammarly, Hemingway etc.)
(Have you used any type of digital language correction?)
12. Vilken information skulle du vilja ha tillgång till vad gäller dina elevers skriftliga språk?

(What information would you like to have access to regarding your students' written language?)

13. Märker du några nya problem pga elevers tillgång till digitala verktyg?

(Have you noticed any new problems due to your students' access to digital tools?)

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