

**2021 Writing Analytics Virtual Symposium: Incubating Writing Analytics
Research in the Time of COVID-19.**

This symposium is sponsored by the Ohio State University, the University of Tartu, and The Journal of Writing Analytics; 18th - 27th May 2021 (online)

Schedule and symposium times ([note all times are UTC](#))

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1 Organizational Structure Analysis of Baltic Academic Writing Papers Using Object Detection Methods

Margaux Susman (University of Bergen, Norway) , Djuddah Leijen (University of Tartu, Estonia), Nicholas Groom (University of Birmingham, United Kingdom), & Christer Johansson (University of Bergen, Norway)

Research on academic writing requires solutions to problems at many levels. Texts are constructed using language, but norms, style and format are equally substantial. English papers have been thoroughly examined in this regard but less prevalent languages have yet to be analyzed.

This paper is part of a larger project, scilicet The Bwrite Project, encompassing a large-scale analysis of rhetorical structure in academic writing in the Baltic States. In order to carry out this examination, we adopt machine learning techniques which allow the automation of the extraction of relevant features. The first feature we were interested in was the discipline a work originates from. An accuracy of 98% was achieved for the problem of classifying academic papers by discipline by means of Scikit-Learn's [1] Multi Layer Perceptron classifier. The second step consists in the extraction of organizational structures. The aim here is to observe whether the IMRaD structure is the prevailing structure in Estonian, Latvian and Lithuanian academic writings as it is in English or whether another predominant structure emerges.

As academic papers are typically provided in the form of PDF documents, transforming the PDF files to text files would bring about the loss of meaningful information, scilicet font size and characteristics such as whether the text is in bold or italics for instance. To prevent such loss, we treat the documents as images and use computer vision methods to analyze them.

In this paper, we apply the Redmon et al.'s algorithm [2] to the analysis of document layouts. The YOLO deep learning model was first proposed in 2016, and later improved to the YOLOv3 algorithm [3]. Unlike other algorithms, YOLOv3 is able, in one run, to both draw the bounding boxes around the regions of interest and estimate the probabilities of a specific label being associated with a bounding box. The algorithm conducts these tasks by means of a single convolutional network (for more information about CNN, see [4]). Additionally, YOLOv3 allows for multilabel classification such that overlapping categories (e.g. between "paragraph" and "section") are allowed [3].

Prior to using YOLOv3, we annotate a training dataset with the open-source annotation tool Open Labeling [5] which performs semantic segmentation of the document images and outputs these annotations in the YOLO format. This format requires the numerical class of the region as well as the four coordinates of the bounding box. The dataset is then adapted for use with YOLOv3.

While computer vision has found some success in detecting organizational structures of text documents (see [6], [7], [8]) , to the best of our knowledge, Huang, Yan, Li and Chen [9] are the only researchers besides us to have used the YOLO algorithm to extract information from PDF documents. More precisely, they adjust the YOLOv3 model to account for the differences between natural objects and two-dimensional document images, i.e. tables. They further improve their method's precision and detection with an anchor optimization method along with careful post-processing.

Huang et al. evaluated their method on two datasets from different ICDAR competitions and reached a precision of 100% on table detection on one dataset and state-of-the-art performances on the second, establishing the ability to generalize and the robustness of their method [9].

Our work suggests that deep-learning techniques are a valuable extension to the toolbox for analyzing academic writing, as they permit us to classify documents according to their field of study and detect their layout. This proposed method can be used to document differences in academic styles and uncover rhetorical structures which lie both in the linguistic content and the organizational structure of the documents.

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2 Writing Analytics for Social Justice Impact: Culturally-Sustaining Anti-Racist Frameworks to Advance Pedagogical and Assessment Approaches for All Learners

Maria Elena Oliveri (University of Nebraska), David Brown (Carnegie Mellon University), Julie Corrigan (Concordia University), Steve Dept (cApStA), Michael Laudenbach (Carnegie Mellon University), Jennifer Randall (University of Massachusetts), & David Slomp (University of Lethbridge)

Panel session leading to Analytics journal article

Our four-paper coordinated session advances three research goals (1) assessment for learning using digital tools and writing analytics to provide feedback on students' writing composition choices, (2) a construct model that includes an expanded set of workplace genres to better prepare students for work, (3) culturally-sustaining anti-racist (CuSAR) frameworks to better support the teaching and assessment of historically marginalized students.

Presenters have a multidisciplinary perspective; their expertise includes (corpus) linguistics, writing analytics, assessment, instructional design, and methodology. From their own perspective, they advance methodological, pedagogical, theoretical, and interventional research to address challenges including, the need to (a) broaden the genres learners engage with to be better prepared for work (Beaufort, 2007), (b) provide instructors with CuSAR approaches, supported by writing analytics, to teach diverse learners, and (c) disrupt the use of white-centric assessment approaches to create a culture of engaged life-long learners (Graham et al., 2013; Sireci, 2021). We focus on teaching and assessing workplace English communication (WEC) skills from a broad curricular perspective to a situated classroom perspective.

The first two presentations by Steve Dept and Jennifer Randall illustrate raciolinguistics and CuSAR frameworks for teaching, learning, and assessing WEC skills for diverse learners. The frameworks highlight the importance of disrupting racist beliefs around knowledge and knowledge-making by actively confronting the economic, structural, and historical roots of inequality, race, and racism. Building on Alim, Rickford and Ball (2016) and Flores and Rosa (2015), work on raciolinguistics Dept elaborates on discourse racialization to explore relations between language and race. Raciolinguistics proposes that language and race be analyzed jointly as a continuum rather than as standing in polar opposites; and, posits that race modifies language patterns. One lens through which Dept gauges this complexity is the difficulty for non-American Africans to come to terms with the American racialization of discourse: he uncovers the underlying cultural and historical bias in the labile notion of standard language. For affirmative linguistic action to be effective in assessment, it needs to be dynamic and transracial. Thus, transracialization focuses on initiatives taken by educators and test developers to proactively resist ethnic categorization and, concomitantly, to use such categories creatively to operationalize fairness and equity. This implies cross-pollination of race and language. Randall's presentation advances a CuSAR framework to teaching and assessing WEC. Randall uses examples to illustrate how assessment can be used to sustain and affirm (not erase or assimilate) individuals, their linguistic patterns, and the multiple literacies of historically marginalized communities. From a justice-oriented approach, applications that explicitly reconstruct oppressive and dehumanizing hierarchical racial power arrangements that have been historically (re)produced via writing assessments and the consequences (for student development and well-being) of failing to do so will be demonstrated.

Focusing on a classroom perspective, the third presentation (Brown and Laudenbach) illustrates the application of DocuScope (a technology-based text-visualization tool) to formatively assess writing in an introductory social justice statistics course. The course teaches students to critically interrogate quantitative information and effectively communicate with diverse audiences. Brown and Laudenbach will demonstrate how to (a) blend rhetorical genre principles relevant to writing about statistical information with a hands-on portion for students to visualize their written composition choices and (b) use DocuScope to enable instructors to assess students' content knowledge expediently and provide students with timely feedback and scaffolding to support learning. Students' texts at various stages including drafts, projects, and final papers will be used in the demonstration. Brown and Laudenbach also will illustrate how student papers can be compared to instructors' model papers for use as reference. Their preliminary findings reveal that linguistic patterns from the model paper were overrepresented in student writing when compared to a corpus of published articles from peer-reviewed statistics journals. These results illustrate how instructors can use DocuScope in class to decide patterns to explicitly highlight in their teaching so instructors can determine whether students ought to emulate the model paper or more expert writing samples.

The fourth presentation (Slomp, Corrigan, and Oliveri) will focus on applying principled design frameworks—Integrated Design and Appraisal Framework (IDAF) and Theory of Action (ToA)—to the design of a technology-based formative assessment for learning of WEC skills (Oliveri et al., in press). The IDAF and ToA frameworks compel assessment designers to attend to issues of fairness and consequences at every stage of an assessment's design, implementation and use. This presentation illustrates the power of these frameworks for helping to create justice-oriented next generation writing assessment programs.

Time permitting, the panelists will engage with audience member questions.

Key words: antiracist assessment, continuum, cultural bias, culturally sustaining assessment, fairness, language and race, literacy assessment, non-American African English, raciolinguistics, writing analytics, writing assessment

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3 Developing Writers' Engagement in Argumentative Genres

Tom Slagle (Kent State University)

Proposal

Research in assessment finds that the use of interpersonal resources is a significant factor in the judged quality of undergraduate writing (Mei, 2007; Uccelli et al., 2013; Lancaster, 2014, 2016a; Aull et al., 2017; Brown & Aull, 2017). Using cross-sectional methods, these studies suggest common developmental trajectories in students' stance expressions and their use of interpersonal resources generally by examining variation based on level (Staples et al., 2016; Arthurs, 2018), disciplinary expectations (Lancaster, 2016b; Yoon & Romer, 2020), and genre (Hardy & Frigal, 2016; Aull, 2019). Research characterizing the use of these interpersonal resources in the writing of first-year students based on placement, however, is sparse (see, for example, Gere et al., 2013). Given efforts to reform developmental education (Hassel & Giordano, 2015; Nazzal et al., 2019; Armstrong et al., 2020), such research could provide alternative metrics for students' placement in first-year writing courses. This study is thus motivated by the question: In what ways, if any, do the dialogic spaces differ between students enrolled in a preparatory, developmental writing course and students placed in a first-year, college-level writing course? Specifically, what stance expressions and engagement resources do these students typically use to create dialogic spaces?

To answer this question, the study examined the use of interpersonal resources in two specialized corpora consisting of argumentative writing by students placed in a co-requisite course (PREP) and a standard first-year writing course (FYW) at a public university in Ohio. Using the concordance software AntConc (2019) and drawing on the Engagement framework (Martin & White, 2005), I quantified and qualitatively analyzed linguistic cues of "interactional stance" (Lancaster, 2016a, p. 16) in both corpora as students engage "alternative viewpoints" in the form of source texts (Martin & White, 2005, p. 93). By analyzing these linguistic resources within the Engagement system, I aim to characterize the dialogic space created by these two groups of students through an examination of the stance-taking qualities they use to create this space. I believe characterizing the dialogic space students create when engaging source texts and "alternative viewpoints" will provide insights on students' preparedness for college-level writing given that the findings of previous studies suggest that these stance-taking qualities have a significant effect on instructors' assessment.

The results of this study confirm and complicate previous analyses, finding that FYW students are more likely to express a balanced, critical stance than PREP students through a strategic use of hedges and contrastive connectors to create critical distance while PREP students express a more personalized, affective stance. After exploring these results, my presentation will discuss how these approaches to discourse analysis can be used to measure standard learning outcomes for first-year writing such as critical thinking, rhetorical awareness, and source use. Ultimately, through what Aull (2015) describes as "context-informed corpus linguistic analysis," which requires the examination of written texts in conjunction with social context, the study hopes to address the "social consequences" of students' placement in general education, or "gateway" courses (Dryer, 2013, pp. 3–4; Hughes & Li, 2019, p. 74), given that conventional measures for placement, specifically standardized test scores such as the ACT and SAT, have shown to reinforce racial and socioeconomic inequalities (Rosinger et al, 2020; Armstrong et al, 2020, p. 83; Nelms, 2020).

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4 [A Mixed Method Framework for Interpreting Relationships between Curricular Features and Features of Student Writing in Situated Writing Tasks](#)

Kyle Oddis (Northeastern University), Jill Burstein (ETS), Daniel McCaffrey (ETS), & Steven Holtzman (ETS)

Potential article (or research note)

In order to comprehensively learn about what makes students “successful” in writing at the postsecondary level, we must also understand how students have been instructed to complete situated writing tasks. This potential article/research note offers a framework for studying the contextual relationships between postsecondary writing curriculum and student success in completing writing tasks using a dataset of 48 curricular texts (rubrics, assignment sheets, and syllabi) collected from 21 instructors from 5 disciplines across 6 U.S. postsecondary institutions.¹

Researchers interested in quantitative measures of student success and mixed method research approaches to writing studies cannot control completely for situational and contextual factors which are site-based (i.e., in the context of a specific instructor’s writing classroom at a specific postsecondary institution or--in the wake of the pandemic, for instance--shifts to remote learning and integration of various digital tools into curricular and pedagogical practices). This inability to control for local, site-based “features” of curriculum in studies of student writing achievement adds complexity to interpretation of features present in student writing--features that research organizations like Educational Testing Service, for example, can interpret through statistical analysis of student-generated texts.

Our study acknowledges and explores the understudied relationship between writing features of student-generated texts and textual features of instructor-generated curricular materials, highlighting the challenges inherent in quantifying what it means for students and instructors to “co-create” knowledge in writing. In the recent issues of *The Journal of Writing Analytics* and *Accountability in Research*, Ian Anson discusses texts-as-data (2020a) and with Cary Moskovitz, text recycling practices (2020b), two concepts that we take up in this study given that curricular texts are often subject to text recycling and are, consequently, ideal for analysis as texts-as-data, especially since they affect how students execute writing tasks. Our study demonstrates that there are identifiable features of postsecondary writing curriculum that can be qualitatively coded for, counted, and mapped onto student writing features, and expands upon prior research by Dan Melzer (2014), Laura Aull (2015; 2019), and Norbert Elliot (2016) among others.

This potential article/research note:

- 1) presents a set of analytic and holistic scoring rubrics designed using a trifold theoretical framework--genre studies (Devitt, 2004), threshold concepts in writing studies (Adler-Kassner & Wardle, 2016), and Universal Design for Learning (UDL) (Meyer et al., 2014)--to assign quality ratings to texts in a curricular dataset based on qualitative coding;

¹ This exploratory study was conducted as part of a larger IES grant-funded study: Award Number R305A160115. Opinions, findings, conclusions, or recommendations are those of the authors and do not necessarily reflect the views of the IES. gInformation on the larger study can be obtained here: <https://ies.ed.gov/funding/grantsearch/details.asp?ID=1807>

- 2) describes a protocol for training raters to use the theoretically-grounded rubrics to score texts in the curricular dataset which may then be used for statistical analysis; and
- 3) explores opportunities for future research in writing studies and writing analytics using a mixed method approach which may be consequential for writing program administrators, researchers, and for professional development of faculty who teach writing at the postsecondary level.

This study creates space for writing analytics uptakes in challenging inter/multidisciplinary research teams to apply data collection practices and analysis methods not only to study features of student-generated texts, but also instructor-designed and program-specific texts that can be understood as curricular or pedagogical data. There is great potential for applying writing analytics methods to student- and instructor-generated texts side-by-side to aid researchers in understanding the relationship between *what* students write and *how* they are asked to write in postsecondary contexts.

Notably, our study also illustrates what happens when data collection practices are insufficient to yield usable, reliable statistical results. We offer suggestions for inter/multidisciplinary research teams that seek to better understand the relationship between curriculum, pedagogy, and student achievement in writing across the curriculum, across disciplines, and across institutions based on the results and observations of our study. In this way, our work also highlights limitations and challenges of mixed method research approaches in writing studies and calls for deeper/broader consideration of texts-as-data to include curricular documents--like syllabi, scoring rubrics, and assignment sheets--alongside pedagogical data to fill in a more complete/comprehensive picture of how postsecondary writing programs, instructors, and students teach and learn writing.

Keywords: Writing studies, curriculum, research methods, faculty development, mixed method research, qualitative analysis, writing assessment

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5 Exploring Logging Data for Indicators of Writing Strategies and Profiles

Curtis Gautschi, Otto Kruse, & Christian Rapp
(Zurich University of Applied Sciences, Switzerland)

Thesis Writer (TW, www.thesiswriter.eu), implemented as Software-as-a-Service, is a bilingual (German, English) writing platform that collects logging data and offers a time slider to scrutinize and recall writing processes. The data provide insights into natural writing processes as they occur during thesis writing as part of various writing projects, and stretched across several months, showing the normal patterns of writing, revising, and structuring. In this project, we aim to find meaningful and useful quantitative indicators which allow us to estimate basic parameters of writing such as writing speed, productivity, lexical density, and amount of revision activities. From these measures, we draw inferences on writing styles and strategies. Evaluations of such unstructured and unselected data pose considerable problems on the statistical methods to implement, and we invite viewers, in this presentation, to follow us applying and interpreting these measures. Rather than final results, we will present ongoing work with open questions we pose for discussion based on the initial analyses.

Method

Nine texts written within TW, consisting of BA theses that were mostly in the early stages of development (on average, approximately 2,100 words in length) were selected for analysis. All recorded logging data for the selected texts and their subsections (e.g., State of knowledge, Results, Discussion) was compiled into a dataframe, where each row represents a recorded event. Recorded events contain text ID numbers, text subsection IDs, timestamps, and full copies of the text for each event. Thus, dataframes contain all incremental versions of the text through the lifetime of the writing project (on average over 2,500 events recorded per text). Next, texts for each ID were compiled into separate corpora and processed using the `quanteda` R package (Benoit et al. 2018), extracting the following: tokens, types, characters, CTTR (Carroll's Corrected Type-Token Ratio), for each incremental version of the texts (i.e., for each event). These were subsequently added to the dataframe. The following extra variables, for the purpose of quantifying incremental changes to texts to examine patterns, were then calculated and added:

- `deltachars` (delta characters): the incremental change in the number of characters for each subsequent recorded event
- `wpm` (words per minute): change in the number of words divided by the time elapsed over 5 recorded events (thus, a moving average).

Finally, additional summary statistics, to examine the relative parsimony or overall “efficiency”, were calculated:

- the total number of characters added/removed per text (and subsection)
- the total number of characters in the final text (and each subsection)
- the proportion of text kept/deleted relative to the final text
- the ratio of kept to deleted.

Results

In our presentation, we compare the various quantitative data indicators in plots with a view to identifying writing styles and profiles. Since the identification of writing profiles and styles requires qualitative analysis to validate the interpretations of the quantitative data, we also present time-slider videos to illustrate the gradual development of texts. Our aim is to arrive at automatically processable data which can be used as feedback for the writers.

6 Measuring knowledge (re)circulation: A corpus analysis of an FYW curriculum through the frameworks of assemblage theory and LCS patterns

Adam Phillips (University of South Florida, Tampa)

Proposal

Knowledge circulation and recirculation has been largely overlooked within Rhetoric and Composition/Writing Studies (RC/WS). Apart from an occasional aside within transfer literature, knowledge (re)circulation has failed to garner much theoretical attention within our field and even less attention within the field's empirical research literature. This research will attempt to occupy this space through a corpus analysis of three (3) genres of first-year writing (FYW) assignments that targets linguistic, cultural, and substantive (LCS) language patterns (Mislevy, 2018; Mislevy & Elliot, 2020) structured by the ecological framework of assemblage theory, developed by Deleuze and Guattari (1980/1987) and further amended by DeLanda (2006/2016). By using assemblage theory and a sociocultural research method (LCS), this research attempts to understand student knowledge (re)circulation across genres and theorize how to best incorporate this empirical knowledge into writing curricula in a pedagogically beneficial manner.

Of course, pedagogy is driven by theory and put into practice by administrators. This research views student knowledge as an assemblage with a variety of moving pieces and parts that all affect and are affected by each other. Assemblage theory's ability to analyze both micro- and macro-level environments allow for a richer understanding of student writing, enabling researchers to disassemble student writing in order to better isolate and highlight specifically targeted features, potentially yielding valuable insights for pedagogical and curricular knowledge. Due to its focus on relations of exteriority, assemblage theory will enable this research to isolate micro-level patterns—such as linguistic features and lexical patterns—as well as macro-level patterns—such as the relationships between collections of genre-specific writing—within a given corpus.

The data used for this research has been extracted from a FYW curriculum at a large research university that was designed largely around the concept of Swale's (2017) discourse communities. Along with a large corpus of student writing, the researcher had access to not only the task rubrics, syllabus, glossary of important terms for students, and various other useful documentation, but also the research and literature that inspired the design of this curriculum, such as the "WPA Outcomes Statement for First--Year Composition" (CWPA, 2008) and *Framework for Success in Postsecondary Writing* (CWPA, NCTE, & NWP, 2011). These documents and sources help to better understand the potential presence of LCS patterns.

Framed around Mislevy's (2018) LCS patterns, this research builds from Marcellino's (2019) quantitative study and will attempt to identify and understand how students navigate across genres in diverse ways to (re)circulate knowledge by identifying LCS patterns within the sampled corpus using RAND Corporation's RAND-Lex platform. Furthermore, this research is guided by a theoretical construct of writing knowledge within the cognitive domain (White et al., 2015) as well as a variable model that targets facets of writing knowledge that are present, firmly placing this project within the field of Writing Analytics.

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7 Matters of Scale and Scalability: The Ethical Calculus of Big Data Use and Compilation in Writing Analytics

Johanna Phelps (Washington State University)

Potential article

Ultimately intended to be a research note for *Journal of Writing Analytics*, I am seeking conversation and feedback on two visualizations and a heuristic regarding the generalizability, scale, and reach of research outputs based on data generated by human participants. The amplification of ethical concerns is paramount to research in writing analytics, from the inception of research in its design to its consumption and replication. I suggest that robust and ethically designed research based upon foundational principles in moral philosophy, especially justice and fairness, advance writing analytics as a field. Two questions serve as a framing tactic for a conversation regarding the visualizations and heuristic: (1) Which foundational ethical principles from moral philosophy can guide writing analytics researchers and audiences in the ethical design, deployment, analysis, and consumption of research with data generated by humans? And (2) What strategies, including existing policy and disciplinary guidance, are available to writing analytics authors and researchers to inform the ethical design, deployment and consumption of research with data generated by humans?

Despite the journal's relative youth, scholars have already grappled with these issues from varying angles in *Analytics*. Research is consequential, a point Stephens (2017) noted in regard to large scale analytics in writing studies and Rudniy (2019) discussed efforts to protect participant identities in research while noting the challenges with de-identifying data for analysis and re-use in writing analytics. Lang et al. (2019) recognize the burgeoning ethical issues that big data raises in writing analytics research. Chief among Lang et al.'s concerns included issues of privacy, interactions with IRBs, and considerations of the interpretive power of data sets in writing analytics. These concerns are echoed in the conversation amongst Cushman, Poe, and Kelly-Riley. Poe (2019) points out that early empirical research in Writing Studies problematically did not consider the issues of participants' autonomy, noting that "distressingly" prior editors of eminent journals in Writing Studies, ignored the protections in place for human participants, despite clear necessity to consider student-produced texts in some class of protected data.

Poe, Cushman, and Kelly-Riley's (2019) discussion at the conclusion of V3 of *Analytics* noted the acute tension amongst the issues of research design, participant engagement, empiricism, and the development of a discipline. These challenges are helpfully addressed by situating scholarship in concomitant literature on research ethics and moral philosophy in order to develop a baseline of material for future researchers and to engage the multiple methodologies and paradigms already operating in the production of Writing Analytics scholarship. The foundational principles driving the discipline and its scholars warrant considered attention. I hope this presentation sparks a conversation concerning possible approaches to ethical concerns, discussion of the efficacy of visualizations in conveying how matters of scale and consequence influence the way we go about our work with building, sharing, and consolidating data in Writing Analytics.

Keywords: moral philosophy, writing analytics, research ethics, generalizability, data compilation

8 [Advancing writing analytics methodologies: A hybrid approach to analyzing errors in automated rhetorical feedback](#)

Elena Cotos (Iowa State University)

Potential article

Automated writing evaluation (AWE) entered the scene of academic writing pedagogy with a promising potential to enhance writing development through individualized formative feedback. However, despite evidence of positive impact (Stevenson, 2016), AWE technologies have been vehemently criticized because, to writing teachers, their engines running in the background are nothing but black-boxes (Herrington & Moran, 2012) that evaluate writing based on aggregated quantifiable text features (Shermis & Burstein, 2013). Writing, however, is essentially about meaning making and reflects rhetorical aspects of different social and academic genres (Perelman, 2012). This criticism requires revisiting a challenging yet foundational question for academic writing teachers: How can we, as stakeholders in AWE-assisted writing support, ensure that AWE technologies help us appropriately focus on important traits of writing as communicative practice?

Addressing this question requires an understanding of a myriad of factors, which may or may not be automatically predicted and measured. An essential aspect that can and should be considered in advance, though, is how automated feedback is generated. However, this is an important link that is blurred in the chain of validity argument reasoning for AWE (Chapelle, Cotos, & Lee, 2015) because the measures typically used to evaluate AWE systems performance (i.e., precision, recall, accuracy, F-measure) fail to shed light on why their black box engines (e.g., statistical and machine learning models) produce errors when analyzing student texts. If the computational models are not explainable and interpretable, the underlying reasons for AWE feedback errors cannot be understood and the quality of feedback cannot be improved. Consequently, teachers guidance and students benefits from AWE feedback will continue to be hampered. This is particularly true for genre-based AWE, where rhetorical feedback is contingent on human interpretation, which is not accounted for by the black box models. Addressing this problem requires new, hybrid methods of inquiry.

In view of these issues, this study aimed to identify, describe, and explain the errors of a genre-based AWE tool (Cotos, 2017) that generates feedback on research article rhetorical traits, called moves (Swales, 1990). The research approach entailed integrating both qualitative and quantitative analyses of errors in feedback produced by this tools black box engine. Cumulative outcomes enabled a complex investigation based on teacher interpretation and automated rhetorical feedback.

More specifically, using the move feedback generated by the machine learning engine of the AWE tool under investigation, a dataset of erroneously classified sentences (#597) was scrutinized to understand whether and how linguistic n-gram features contained within a sentence contributed to its automated classification into a certain move. For that, the move of each sentence as well as the rhetorical function of each n-gram in each sentence were first determined by two teachers, and the features were manually coded as: indicative of the actual move, indicative of the misclassified move, or non-indicative of any rhetorical intent. Second, two pre-classification feature metrics (odds ratio for actual and misclassified moves, and odds ratio difference) and a post-classification feature metric (feature weight) for each n-gram feature were calculated and compared to determine the extent of individual features contribution to automated classification into moves. Third, the teacher-interpretive and classification-driven data were mapped, and possible sources of AWE feedback errors were identified. Finally, mapping of these

data allowed for conducting several statistical experiments to understand the relationship between the teachers coding of features and feature metrics.

The findings reveal feature-related constraints affecting the accuracy of automated rhetorical feedback and describe error patterns caused by linguistic features at sentence level (e.g., misleading, ambiguous, lacking, underrepresented, competing features). The implications of this study are two-fold: (1) the results can optimize writing teachers understanding of the limitations of automated rhetorical feedback targeting the communicative dimension of academic genres, and (2) the integrative methodology enables transparent black box evaluation, with that paving the way for teacher-informed augmented methods needed to improve AWE rhetorical feedback for genre writers.

Keywords: rhetorical feedback, move, classification error analysis, n-gram features, feature metrics

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9 [Making Multilingual Writers Matter in Program Assessment: What Do You Do When There Is No Institutional Data for Disaggregation?](#)

Mya Poe (Northeastern University), Qianqian Zhang-Wu (Northeastern University), Cherice Escobar Jones (Northeastern University), Cara Marta Messina (Jacksonville State University), & Devon Regan, (Northeastern University)

Presentation based on an in-progress book project.

Like many universities in the U.S. today, Northeastern University's (NU) international student population has grown substantially over the last 10 years. International students now comprise 20% of the university's undergraduate student population as well as upwards of 50% of the graduate student population (Northeastern, 2019). Along with the growth in NU's international student population has also been growth in the number of students who identify as multilingual. Given such changes in our international and domestic student populations, the Northeastern Writing Program began a series of research and pedagogical changes to better understand and address the needs of multilingual students (Gallagher & Noonan, 2018). For example, the Multilingual Writers Research Project (MWRP) was established in 2009 to better understand the shifting demographics at NU with the goal of better supporting students in writing classes. MWRP surveys from 2014 and 2015, for example, showed that more than 40% of respondents identified as multilingual (Benda et al., 2018). Insights from the MWRP have informed writing center research and writing program course development for upper-level writing courses (Advanced Writing in the Disciplines) (Benda et al., forthcoming).

In our most recent program assessment work, we draw on insights from the MWRP into our outcomes assessment processes (Poe & Zhang-Wu, 2020). Although the writing program had occasionally undertaken program assessment of specific learning outcomes related to writing, we had not connected learning outcomes to students' linguistic identities. This type of disaggregation, however, presented a challenge. While NU reports residency status, it does not gather institutional data on students' linguistic identities. When we reviewed the research literature, we discovered that other institutions were also struggling with this issue. Moreover, while studies have investigated raters' scores on multilingual writers' texts, there has been more limited research on how such insights might inform outcomes assessment (Casal & Li, 2019; Friginal, Li, & Weigle, 2014; Jarvis et al., 2003; Lindsey & Crusan, 2015).

This panel of speakers, including faculty, graduate students, and an undergraduate student, reports on how our writing program attempted to address this shortcoming through a sequential mixed-methods study design with attention to consequential validity evidence (Slomp, Corrigan, & Sugimoto, 2014). Our research questions were as follows: How do students identify their linguistic identities across different contexts? Are students meeting the general education learning goals for writing courses? How are students who identify as multilingual meeting those goals? What can students tell us about their linguistic identities that expand, challenge, or reshape our answers to the above questions?

Data collection for this study was conducted from 2019-2021 and focused on students in advanced writing courses (AWD) in the NU writing program. We adopted a sequential mixed-methods study design, in which "[o]ne type of data provides a basis for collection of another type of data" (Cameron, 2009, p. 144). Specifically, given the fluidity of the definition of multilingual students, we adopted

quantitative survey analysis to inform our subsequent outcomes analysis and in-depth qualitative interviews with a small group of students.

We analyzed four datasets: 1) an outcomes assessment of AWD student writing, 2) a survey distributed to AWD students, 3) triangulated dataset with both the outcomes assessment and survey results, and 4) interviews with AWD students who had completed the survey and submitted writing for the outcomes scoring.

- 1) **Outcomes assessment:** Student writing samples (n=1124 samples) were gathered three times during Spring 2020 (January, February, and April) from a sample of AWD courses. These samples were scrubbed of identifying data for scoring and assigned unique identifying numbers. The Writing Program Assessment Committee scored writing samples holistically and also scored six traits, including “audience,” “genre,” “correctness,” and “diversity.”
- 2) **Survey to AWD writers:** A survey, based on previous MWRP surveys, was distributed in Spring 2020 (N=2035 students). Students were asked about their linguistic identities, educational backgrounds, language use patterns, and writing confidence. The survey yielded a response rate of 26%. Our survey data were analyzed using SPSS.
- 3) **Triangulated dataset:** At the end of Spring 2020, we correlated student IDs with survey data and writing sample scores to provide a composite profile of results, including student self-reported demographic information, institutional data, and scoring data. Results were then analyzed statistically using Antconc and Python, incorporating computational text analysis methods such as nGram frequencies, concordances, and parts of speech.
- 4) **Interviews:** The results from the survey and outcome analysis informed the design of our interview questions. Focusing on a small group of 10 multilingual students, we analyzed the data using inductive coding methods to identify overarching themes and patterns that extend the survey findings.

Our findings to date demonstrate that a focus on TOEFL test scores, residency status, or even self-declared linguistic identity alone is insufficient for the purposes of identifying multilingual writers for the purposes of outcomes reporting. Consistent with institutional data, approximately 20% of students on the survey (n=271) reported being international students. Yet, more than 50% of all students surveyed identified as multilingual. Along a variety of markers, our survey showed that multilingual students are not a homogenous group, but tend to have different experiences based on their previous language and educational backgrounds. Our findings, for example, suggest student’s high school backgrounds play a statistically significant role in students’ writerly identity, confidence, and language use. Our interviews with students affirm our survey findings and show multilingual students vary drastically in their self-perceptions as writers and speakers. After interviewing students of various home languages, we found varying degrees of multilingual identification, confidence levels, and language use that were impacted by previous educational experiences.

Through an analysis of our outcomes data, as informed by the survey results, we show how researchers should use a combination of markers for identification and disaggregation. By disaggregating the data by residency status and self-reported linguistic identity, we found that international and domestic students' holistic scores varied depending on the session—i.e., descriptive assignments, research assignments, or reflective assignments. In the descriptive assignments, international students had a lower holistic average (3.39) than domestic students (3.91), while in the research assignments, international students had a higher holistic average (3.96) than domestic students (3.90). Trait scores also showed some surprises. For the “correctness” trait score, both international and domestic students

received an average of 3.35. Further disaggregating the data based on the survey results, we found that students who self-identified as “sort of” multilingual received a higher holistic (4.08) and trait (3.38) scores than students who self-identified as multilingual (3.71, 3.31) and not multilingual (3.94, 3.38). We also found that high school experience is important. Students with no US high school training received lower holistic scores (3.31) than students who went to highschool in the US (3.97); this trend also appeared in the “genre” traits, demonstrating that students with no US highschool curriculum may not be as familiar with genre conventions (2.63) as students who had a US high school curriculum (3.21). Such findings combat the notion that international and multilingual students need better language training. Instead, the scoring differences seem to be whether students have been trained in US curricular contexts, either in the US or abroad.

We believe this novel approach to outcomes assessment has implications for program assessment design, namely in the ways that programs disaggregate data. Moreover, our study contributes to the field of writing analytics by adopting a sequential mixed-methods approach. Such research design has allowed us to assess multilingual students’ writing within our own context in ways that can inform the teaching of writing and subsequent program assessment of writing.

Keywords: multilingual, program assessment, justice, equity, outcomes

10 The Language of Risk: Analyzing risk in global, national, and state-level communication regarding COVID-19

Kathryn Lambrecht (Arizona State University)

Potential article

The global COVID-19 pandemic presented one of the most urgent communication exigencies in recent history. If uncertainty, risk, disparity, and health communication all represent their own communicative challenges in data analytics (Han et al, 2018; Graham, 2015), this health crisis brought them all together and amplified them at a new level. Because the problem of communicating during the pandemic had so many angles and had to be negotiated at so many levels, writing analytics methodologies are a strong fit for approaching the problem of unpacking public health communications from a wide variety of sources. In this project, I will develop and compare several corpora from public health agencies at the global, national, and state levels in order to better understand how communication trends regarding pandemic risk level varied or were consistent across multiple outlets. Looking at these data sets from a variety of levels using large corpora of communication to public audiences will draw out systemic issues in health communication that, once revealed, could be avoided in the future.

This proposal builds on a smaller research project that used a corpus of CDC communications early in the COVID-19 pandemic (January-April 2020) that used collocation and keyword analysis to show that risks to the general public were downplayed and distanced from individuals in the early phases of community spread (Lambrecht, 2020). However, while the CDC has been a major source of information during the pandemic, there were several other mediating communication sources that informed how individuals dealt with uncertainty for better or for worse. The goal of this project is to broaden the scope of the original research question as well as to significantly broaden the dataset in order to get a more complete picture of how communication regarding COVID-19 was aligned or misaligned at various input levels. The first level of corpora will be developed using CDC and WHO communication data collected from public communications about COVID-19 from January 2020 through February 2021. The first phase analysis will seek to answer the question: how did international (WHO) and national health (CDC) communication sources discuss risk and uncertainty at various stages of the COVID-19 pandemic? Using WordSmith tools (Scott, 2017), keyword and collocation analysis will be used to create a profile of risk communication strategy for each organization, as well as to compare the strategies at the broadest level within the study.

In the second data collection phase, corpora will be developed from major news outlets reporting COVID-19 information in the three largest cities of the Western, Midwestern, Southern, and Northern United States. The method for the first phase of data analysis will be repeated for the state-level corpora, allowing for regional comparisons, as well as comparisons of the regional data to the national and international corpora. The second phase analysis will answer the question: in what ways did state-level communication regarding the pandemic differ a) from national and international organization communication efforts and b) from other regions within the United States? This research will offer a data-driven overview of how communication consistency differed or remained the same at multiple levels.

While the development of vaccines has (hopefully) accelerated the timeline to return to pre-pandemic life, this research will use data analytic techniques to better understand how communication was shaped

at multiple levels, presenting ways forward in streamlining and strengthening communication in times of risk and crisis. Though the pandemic has shifted the way we think about our daily lives and operations, there has been no shortage of data created in pursuit of understanding what COVID-19 has meant for how we deal with uncertainty. The goal of this project is to reveal the underlying language structures used to inform public audiences so that future risk and public health communication specialists might consider ways to offer greater consistency and utility for audiences.

Keywords: Risk communication, corpus analysis, technical writing, public health

11 Possibility Meets Reality: Choices, Challenges, and Ongoing Considerations when Building a Digital Writing Program Archive

Neal Lerner, Kyle Oddis, Camila Loforte Bertero, Shannon Lally, & Sofia Noorouzi,
(Northeastern University)

Potential article

In the most recent issue of *The Journal of Writing Analytics*, our research team discusses the potential a digital writing program archive might afford researchers interested in applying writing analytics tools to sets of historical institutional documents (curricular, pedagogical, assessment-related, and administrative). Since publication of “Possibilities for a Public-Facing Digital Writing Program Archive in the Age of Analytics” (Oddis et al., 2020), the Northeastern Writing Program Digital Public Archive (NUWPDPA) has welcomed new team members with more diverse disciplinary backgrounds and interests, and the project has evolved through new sets of unforeseen challenges sparked by decision making processes around the archive’s user-facing structure and metadata--considerations which are both theoretical and pragmatic.

In our proposed symposium session, our team will discuss the realities of the choices, challenges, and ongoing considerations we are facing as the archive recursively materializes and transforms. In the past year, our team has revisited the metadata format for our archival holdings, and is working on building a metadata schema that would allow other institutional archives to join a “network” of writing program archives (which we envisioned in our previous article). We have also started to build the user-facing portion of the archive, and we hope this symposium will provide us with opportunities to discuss presentation options with potential archive users. Finally, we have data to share from the use of analytics tools on a set of syllabi that we have coded, and we also have added oral histories to our holdings.

Keywords: archives, archival studies, digital archives, historiography, project management, writing analytics, writing assessment, writing curriculum, writing pedagogy, writing program, writing program administration, writing studies research

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12 Growing Trees: Visualizing Text Genetics as Sentence History During Writing

Cerstin Mahlow

(School of Applied Linguistics at Zurich University of Applied Sciences, Switzerland)

Preparations for a research agenda for the next 5 years with several sub-projects; PhD thesis proposal for one collaborator (to start in fall 2021); article for a journal (in preparation)

Keystroke-logging records user actions in chronological order. However, the evolution of text is not linear: writers are free to modify the text at any place at any point in time. Linguistic considerations are likely to play an important role in this respect, but there are currently few attempts towards linguistic analysis of writing processes. Leijten et al. (2019) apply existing NLP tools to facilitate analyses at the word level for Dutch and English. Cislaru and Olive (2018) work on French, focusing on P-bursts (Kaufman, Hayes, and Flower, 1986; Baaijen, Galbraith, and Glopper, 2012) and analyze one burst at a time to explore writing routines at the discursive and psycholinguistic levels using manual categorization and annotation. Mahlow (2015) explores fine-grained NLP-based morphological and syntactical analyses for German.

None of these approaches is mature enough to allow linguistic modeling at a large scale and during writing, which is required for:

1. Editing support for writers based on morphosyntactic information during writing. Piotrowski and Mahlow (2009) propose information functions, movement functions, and operations as types of language-aware editing functions, they give examples (Mahlow and Piotrowski 2009b) and point out challenges and limitations (Mahlow and Piotrowski 2009a). The goal here is to help writers by offering functions operating on linguistic units, as writers would use them when talking about their texts.
2. Feedback during writing based on linguistic insights, like flagging inconsistent tenses or highlighting discursive elements to make argumentative chains visible.
3. Visualization of the syntactic evolution of sentences to complement the established representation of changes within words, e.g., replacement of one preposition by another, replacement of a complex noun phrase by a pronoun, deletion of phrases. The ability to trace edits writer may have tried several variants before settling on one would contribute to the detection of the origins of side effects of editing and provide insights for the design of support for error prevention or correction.

Live processing is necessary to enable visualization or functions based on morphosyntactic information using natural language processing (NLP) techniques. Applying NLP to writing poses two main challenges:

1. The text is growing: parsing should be incremental, add newly written parts to the parse tree, and update revised parts. Incremental parsers analyze input word by word and immediately start to construct a parse tree; they assume a linear evolution of text and cannot handle the case of earlier text being changed. However, this extended understanding of incrementality is known in computer science (e.g., Cook and Welsh, 2001), but only for formal languages.
2. The text is unfinished: processing has to be robust in order to handle ill-formedness, incompleteness, and inconsistency. Robust parsing is used for processing learner language or

user-generated content (e.g., Leacock et al., 2010), and in grammar checking (e.g., Jensen et al., 1983; Heidorn, 2000; Clement et al. 2011).

We are currently developing a new method for robust non-linear incremental parsing of writing process data, i.e., syntactic parsing during writing. Syntactic parsing requires (intermediate) product data. We have developed a platform-independent tool to automatically create the corresponding TPSF at any point of the production based on time (pauses) and production criteria (change in production mode (Mahlow, 2015)). Based on the work of Conijn et al. (2019) it is possible to exclude revisions dealing with the correction of typos or spelling errors, which we consider non-essential editing for our purposes.

We use a weighted combination of these three elements: (a) pause, (b) change in production mode, and (c) relevance of editing to decide whether to trigger re-parsing, as well as the scope. The tool is intended to be adapted to users with respect to all three parameters (as a general toggle or with different values). To be able to explain the differences of two versions from a linguistic point of view, we visualize the delta of the corresponding syntactic structure. We are currently exploring various visualizations of the genesis of sentences which contribute to a more broader genesis of the text.

Our experiments indicate several directions for extending our tool and the underlying approach: enabling writers to use the additional view(s) for structuring and editing their texts; giving feedback during writing including the detection of suitable moments for feedback; broader analyses to allow writers and writing consultants alike to follow the progress of writing over several writing sessions for one larger writing assignment or even longer periods covering several writing assignments.

Keywords: incremental parsing, incremental visualization, interactive visualization, time-linear processing, keystroke logging, linguistic modeling

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² **Editor's note.** Due to incompatibilities with the transfer of data from the original file, there may be some errors regarding the characters in this text.

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13 Closing the Text Equity Gap: Using the Writing PACE Meeting to Increase Writing Practice and Performance

Brian Gogan (Western Michigan University)

Potential Article

This presentation shares initial findings from a study of a practice-based intervention that was used in conjunction with over 700 first-year writing students at a four-year public, doctoral-granting, high research activity university.

The intervention is called a Writing PACE (Performance And Critical Exercise) Meeting, and it uses analytics as a means to increase the quantity and qualitative of writing students' peer feedback performances. The analytics are a feature of a peer review and feedback program used across the first-year writing program. Instructors present different components of the analytics, including an information graphic and a comment digest, to students during a one-to-one meeting. Similar to a writing conference, the Writing PACE Meeting has three parts—the first part focusing on the quantity of feedback student writers provide to their peers, the second part focusing on the quality of the feedback student writers provide to their peers, and the third part functioning as a strategy session for future improvement.

The intervention is informed by emergent research in writing analytics and peer feedback (Hart-Davidson & Meeks, 2021; Lundstrom & Baker, 2009; Reese, Rachamalla, Rudniy, Aull, & Eubanks, 2018). Specifically, this presentation responds to calls for strategies that close what might be termed a *text equity gap* among students—that is, a gap in text production that occurs in practice-based setting such as peer review (Gogan & Atkins, 2020).

Initial quantitative analysis on student practice data suggests promising findings in two areas:

- 1) A one-way ANOVA test and corresponding post-hoc tests on initial student practice quartiles revealed that the 25% of students, who initially produced the *least* amount of practice text prior to the intervention, out-produced the top two quartiles of students in peer review writing after the Writing PACE Meeting intervention.
- 2) An analysis of coding data, based upon Smith's study of the final comment genre (1997) and gleaned from final comments exchanged on the peer review platform, reveals that the students who, following the intervention, increased the total number of words in their final comments tended to also increase the number of quality moves in their final comments.

This presentation will elaborate upon these two in-process findings.

Keywords: Text Equity, Peer Review, Feedback Literacy, End Comment

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