

Leveraging Peer Support for Mature Immigrants Learning to Write in Informal Contexts

AMNA LIAQAT, University of Toronto, Toronto, Canada

COSMIN MUNTEANU, University of Toronto Mississauga, Canada

For adult newcomers to countries such as Canada, learning language is more than an academic task. Language proficiency is their gateway to long-term economic and social stability, but limited access to resources contributes to systemic inequities which disproportionately place immigrants at socioeconomic disadvantages. Many new immigrants rely heavily on informal peer-networks to pursue avenues of success within an unfamiliar and inadequate system. To explore how we could leverage such a peer-based approach to meet their needs for feedback and support when learning to write in English, we deployed a peer-based writing app with 16 participants. Post-deployment focus groups and analysis of writing artifacts reveal that the design of writing support tools should present transparent feedback from both peers and automated sources, foster community through semi-structured discussions, incorporate guided review, and scaffold affective development. We discuss how incorporating these elements into the design of community learning platforms can address the language literacy needs of diverse immigrant learners and foster more positive experiences for newcomers as they negotiate their evolving identities.

CCS Concepts:

• **Human-centered computing~Computer supported cooperative work** • *Human-centered computing~Empirical studies in HCI* • *Applied computing~Collaborative learning*

KEYWORDS: Mature learners; older immigrants; language learning; ELL; peer feedback; participatory design

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1 Highly Educated Newcomers to Canada

Conflict, crisis, and economic hardship are prompting the largest-scale international migrations seen to date [19]. Within this context, a large number of immigrants move to Canada every year, with almost a quarter of the population born outside the country [7]. For newcomers to a country where the official language is not their primary language, low literacy

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Author's address: Amna Liaqat, aliaqat@cs.toronto.edu

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is a barrier to many economic, education and social opportunities [17]. This is the case with most immigrants to Canada. Canada accepts many immigrants under the Skilled Worker program, with the aim of meeting labour market demand. As a result, many newcomers to the country are highly educated and highly qualified in their field of work. This is reflected in additional employment-relevant indicators, such as (digital) technology proficiency, with immigrants to Canada being at the same or even higher levels of proficiency than those of similar socio-economic background who were born in Canada [52, 70].

Despite their strong credentials, lack of proficiency in either the official languages (English or French) can lead to discrepancies between skillsets and the careers immigrants can competitively pursue. After 2-4 years, 54% of immigrants are still looking for suitable work [28]. Immigrants face higher unemployment and lower wages for the same jobs, with immigrants earning 15.7% less than individuals born in Canada, which contributes to additional significant social inequities and personal consequences [75].

This mismatch is further worsened for older immigrants who do not enter the public or post-secondary education system as it is not feasible for a variety of socio-economic reasons. Improved literacy is strongly linked with an increase in earnings [22], yet these mature immigrants do not have access to formal, long-term resources for improving their language skills. However, this “middle of the pack” population (in terms of age) is under the heaviest pressure to find employment quickly. This population often settles for lower paying, unstable jobs outside of their skillset. “De-skilling”, where immigrants accept work they are overqualified for, can contribute to mental health issues such as stress, anxiety and depression [13]. Among the reasons suggested in literature for why de-skilling occurs is that of language barriers. Even though immigrants have similar or higher technology skills than their Canadian-born counterparts, language difficulties limit access to important digital resources [16, 70], leading to many immigrants settling for employment not matching their education or skill level – often within the “ethnic economy” [70], further marginalizing immigrants.

Thus, there is a pressing need to design resources for informal learning that are accessible to older immigrants facing structural marginalization. Several resources aim to fill this gap for mature English Language Learners (ELLs), such as government sponsored language classes, conversation circles, and online courses. However, such traditional resources are limited in their capacity to support most mature or older adults in their language learning, as most immigrants often juggle employment (or job seeking) and family care while having limited access to transportation or childcare [44]. Additionally, high student to instructor ratios lead to slow and de-personalized feedback cycles. In this study, we investigate how a community-centered learning support tool can better support mature immigrant learners through transparent feedback, open-ended community discussion boards, and fostering of affective skills.

2 Study Objectives and Contributions

We report on the deployment study of an app to support the long-term writing development of mature immigrant ELLs. Mature ELLs are defined as individuals who have completed post-secondary education and are primarily interested in finding employment or improving their confidence in everyday social situations. We collaborate with highly educated (i.e. completed at least one post-secondary degree) immigrants seeking to improve their English skills as lack of meaningful employment post-immigration puts them at socio-economic risk.

The initial requirements for the design and features of our tool are grounded in a prior investigation of participants' writing samples and Participatory Design (PD) workshops, which

uncovered the need for an interactive tool that allows for collaborative peer-review as a means for providing timely and meaningful writing feedback. This investigation focused on writing as this is the main vehicle through which mature immigrants to Canada acquire language skills (and indirectly, language-mediated cultural knowledge), as shown by prior research (Section 3.1). This allows us to identify areas where writing support tools may help this particular demographic. As we discuss in Section 3.2 of Related Work, such tools have been designed to support ELLs in various settings and for a wide range of educational goals, although with mature immigrant ELLs being underrepresented in this research. As tools for peer feedback hold promise to address some of the barriers mature ELLs have to sustainable language learning support (per the literature surveyed in Section 3.3), we then aim to investigate how a collaborative approach to designing such tools overcomes these barriers and provides self-sustaining support to these learners.

Therefore, in the research presented in this paper, we aim to answer the following overarching questions:

O1: Given mature immigrant ELLs barriers to language acquisition as discussed in Section 1, what learning requirements do they have for an interactive tool that overcomes such barriers?

O2: Grounded in such requirements, and given the Canadian immigrant context (highly educated, skill-focused, and socially-connected, as discussed in Sections 1 and 3), what specific aspects of language learning can be supported by a collaborative writing and feedback tool?

O3: How can such a tool be designed in a manner that capture immigrant's voices and addresses their learning needs?

We address O1 through a study of writing samples collected from mature immigrant ELLs in Canada. We respond to O2 through a thematic analysis of qualitative data collected from the same study as the writing samples, grounded in a separate formative study that validated the need to support collaborative peer writing feedback. We answer O3 through further reflections from design-oriented focus groups with mature immigrant ELLs, anchored in literature, leading to design recommendations for language learning support tools. For practical reasons, we refine some of the above overarching questions into specific research questions (detailed in Sections 4 through 8)

By answering the above questions, we contribute insights on approaches to better support mature immigrant ELLs. These insights extend prior research on scaffolded learning and mechanisms of peer feedback for ELLs to a group that comparatively receives less attention. In particular, our research suggests that mature immigrant ELLs could benefit from peer feedback mechanisms incorporating diverse sources, where the localized feedback is honest (justified in a transparent way). Our participants' learning can be better supported through a community approach, fostered as open-ended discussion rather than imposing a formal structure for the peer-review. Developing learning support technologies for mature immigrant ELLs cannot be approached in the same way as for "students" given different attitudes to making mistakes and different goals for (life-long) learning.

3 Related Work

Despite strong qualifications, newcomers to Canada face many formalized barriers to improving literacy and accessing meaningful employment. Government sponsored programs offer in-class instructors and a structured curriculum, but newcomers are eligible for these programs for a short term. Longer term resources include community organized events, like conversation circles, which provide opportunities for regular practice. However, they lack the

infrastructure for providing consistent feedback and measuring progress over time. Large-scale online courses have potential to provide long-term opportunities for practice and feedback through personalization of the learning process, but personalization for diverse learners is not possible without understanding their goals, needs, and learning behaviours. To design a sustainable end-to-end writing practice platform for mature ELLs, there is a need to collaborate closely with this learner sub-population to understand their motivations, goals, and writing practices.

3.1 Language Learning Needs of Canadian Immigrants

Immigrant ELLs have both a short-term need to learn language and a long-term need to make sense of and navigate a new culture, with the classroom often failing to prepare them for the latter [12]. When a newcomer does not have the tools for navigating an everyday situation such as going to the doctor or to the bank, the impact on self-confidence and self-esteem has long-term consequences on identity and sense of belonging [53]. The stigma of being labelled “illiterate” can prompt feelings of shame and embarrassment for immigrants, which can lead to dropping out of classes and avoiding situations where they may feel exposed [32]. In adult education contexts, teaching methods and course content should align with learners’ needs as learners return to the classroom with defined objectives [71]. However, government offered classes are broad in focus and cannot cater to focused goals, which means that immigrants have to make do with what is offered to them [32].

Language learning for immigrants exceeds a simple, functional role. Within the Canadian context, this provides a culture acquisition opportunity as well. The curriculum for government-sponsored adult programs focuses on language specific to day-to-day interactions or workplace settings such as emailing a manager or contacting a municipal centre about a children’s sports program [49]. Language classes offered to immigrants also represent opportunities for establishing much-needed social networks, as well as a platform for maintaining language skills without worries about the social implications of lacking proficiency [67].

Newcomers must negotiate identities and roles within a complex postcolonial landscape [30]. Technology, and in particular, social media, is often a preferred mechanism for immigrants to acquire cultural knowledge [64, 70]. This technology use even transcends socio-economic and education limitations, as seen in research with immigrants to Canada in the context of other immigration schemes, such as refugee resettlement programs [64]. However, language barriers in accessing cross-cultural resources [16] lead to such activities being often confined to an “ethnic bubble” [64]. For many immigrants, their goal is not the learning of the language itself, but the opportunities that the language acquisition offers in the workplace and in the community [38]. Similar to a monolingual speaker employing different styles of communication dependent on the situation, learning English is a tool for thriving in an English speaking community [38]. To meet this need, task-based, functional language learning is required [31]. However, the functional literacy that is learned situationally by engaging in everyday tasks is not sufficient, as this does not prepare an ELL for unexpected situations or colloquialisms [32]. Thus, there is a need for a tool that can prepare ELLs to confidently engage in such every day, informal situations.

Immigrant ELLs may face additional barriers that suggest the need for a tool they can access outside of classroom-type programs. In particular, immigrants face employment pressures and at the same time may lack access to extensive resources such as transportation. These limit their

ability to fully benefit from many available programs [44, 67, 70]. Tools to support learning outside the classroom have been proposed to mitigate such barriers [15, 44, 45, 68]. Given the expected technology proficiency of immigrants to Canada, it is expected that a web-based tool would not represent a technology barrier in itself [70].

3.2 Existing writing support tools

Few computer-based writing support tools have been designed for ELLs, with the majority of tools having been designed and assessed with native speakers in academic settings [40]. A major limitation of transferring these tools to the mature immigrant ELLs context is that they were designed for younger students studying within formal academic structures. Key distinctions between these two groups include differences in motivations for achieving success, in the types of writing errors made, and in responses to feedback [11, 34, 54].

W-Pal is an automated feedback system developed with high-school students [54], while tools such as AWA (a system that automatically assess writing per a benchmark) [26] were designed for post-secondary students who are highly proficient users of English. The features of these systems cannot be transferred to contexts outside of their intended use. For instance, low proficiency writers have greater diversity in the types of errors they produce, which makes designing targeted interventions more challenging [51]. Also, the strategies, rhetoric, and linguistics of ELL writing differs from that of native speakers [11, 59]. ELLs tend to plan less before they write and produce structurally simpler writing and make use of different rhetorical devices [59]. For instance, ELLs may translate a phrase word-by-word from their native language into English which results in a syntactically incorrect translation [10].

ELLs may also struggle in interpreting technical language used to provide feedback, such as in AWA. This poses more of an issue when there is no instructor to provide clarification. These tools generally require an instructor to facilitate the software, but many mature ELLs may not be taking classes or have access to an instructor to facilitate the process. These system designs are impracticable for immigrant ELLs learning informally. As well, some mature ELLs do not find classes useful for language learning. Interestingly, these ELLs do benefit from connecting with like-minded peers that extends into a reciprocal help-sharing relationship even outside the classroom [32]. The lack of timely access to an instructor is one of the motivations behind leveraging peer-support, as in the iHelp system [3]. The existing evidence of new immigrants actively seeking out peer communities for guidance and support additionally motivates this present study [32].

3.3 Designing Peer-review for Mature ELLs

Peer-review, where learners assess one another's writing, allows learners to develop judgement skills through reflection on their peer's work and their own [9, 48]. The peer-review process has been extensively studied in formal learning contexts, such as within the classroom. A key distinction in informal environments is that peer feedback has lower perceived quality compared to in the classroom, likely due to academic related incentives such as grades and social ties [69]. In traditional settings, an instructor can guide learners in providing and responding to feedback. However, there are few online feedback exchange systems that support the end-to-end peer review process [24]. Additionally, peer review platforms such as UCLA's Calibrated Peer Review (CPR) or Peerceptiv [50] also require instructor facilitation. In contrast, in online peer-initiated communities, conversations are directed by the learners, and groups build knowledge by reinterpreting peer comments and questioning peers' assumptions [74].

Informal learners do not have access to expert feedback, which necessitates an understanding of how peer-review systems can be redesigned to minimize the instructor-in-the-loop. Thus, in informal learning, the design of scaffolds, such as rubrics, plays an essential role in facilitating the peer-review process.

Mature ELLs in informal learning environments are distinct in several ways from younger learners in academic settings, which motivates the need to evaluate the viability of peer-review in this unique context. Since mature ELLs have substantial education, engaging in peer-review involves a transfer of existing skills to a new context rather than developing these skills from scratch [34]. Adult learners may have increased anxiety about resuming education after a long gap [71]. The pressing need to find employment rather than to succeed academically poses different motivators for engaging in these learning tasks and possibly different values on the type of guidance received [35]. While peer-review has potential to be a timely, meaningful source of feedback, tools must be designed to mitigate these challenges faced by mature ELLs. For these reasons, we explore how a community-supported peer-review platform has the potential to overcome the barriers to literacy faced by mature ELLs in informal learning contexts.

4 Formative Study: Developing Early Requirements

We summarize here a yearlong formative field study that was conducted to inform the design of the tool deployed in the present study. We collaborated with 16 mature ELLs (13 female) to observe how they engage in the traditional peer-review process without interventions to inform the design of a support tool. Participants were recruited from language programs for immigrants, were of the typical age for mature immigrants to Canada (average age 38), and held advanced degrees (Bachelor's or above, which is also typical of the vast majority of immigrants to Canada). In the study, essay writing and peer feedback samples collected from participants during several in-lab activities were analyzed by an independent instructor specialized in adult ELL education, following a rubric similar to that used in such language programs (the instructor was not active at that moment in those programs, to avoid any potential ethical breaches). Participants also completed short questionnaires sampling epistemic beliefs and attitudes / approaches to language learning as well as quality ratings of prior-produced feedback samples. This then informed follow-up participatory design sessions in which seven participants, working in groups of three and four, worked on redesigning the standard (often paper-based) feedback rubrics they normally use in their language classes. Additionally, participants engaged in think-aloud activities focused on uncovering workflow issues when engaged in a collaborative peer review of an essay. These Participatory Design style sessions aimed to understand the interplay between the personal, cultural, social, and educational contexts of mature immigrant ELLs. Researchers' notes, participants' artefacts, data from questionnaires, and annotated transcripts of participatory design interactions were then synthesized through thematic analysis. Four findings that inform the app design in present study are presented next.

First, data from questionnaires indicated that mature ELLs had both high intrinsic motivation [14] (learning driven by desire to master the task), and high extrinsic motivation (learning driven by external factors) to learn to write. While extrinsic motivation is typically associated with academic grades, in our study many of the participants were instead under the pressure of needing to learn writing skills to improve their employability. Therefore, unlike in an academic

context, numerical grades without suggestions for improvement may not be as meaningful to adult ELLs. This is summarized in the first early (formative) requirement finding:

Formative feedback that helps quicken writing development may be more valuable to adult immigrant ELLs than numerical scores.

However, immigrants typically learn language skills in classrooms where frequent, timely, and personalized formative feedback is not always possible. The formative study examined whether adult ELLs could receive this formative feedback from a more accessible source - their peers. The analysis of the peer feedback samples collected from participants suggested that:

While mature ELLs can provide high level (relevant, qualitative comments) feedback, they provide more low level (grammar correction) feedback in free-form peer-review.

The study also explored if mature ELLs would accept peer feedback by presenting instructor and peer feedback without labelling the source of the feedback. Analysis of data from questionnaires and from researchers' direct interaction with participants during the in-person session indicated that:

There was no difference detected in mature immigrant ELL acceptance of peer and instructor feedback.

As we found that mature ELLs could provide high quality feedback and were accepting of peer-feedback, we concluded that a peer-review platform has the potential to support mature ELLs in receiving timely, meaningful writing feedback. The participatory sessions, run by the researcher with seven learners (subset of those involved in the initial writing activities) produced design artefacts, observations by the researcher, and data in the form of transcripts from interacting with participants or between participants. The thematic analysis of these mixed sources of insights allowed us to establish the early design requirements for a peer-review app. Primarily, we discovered that:

Writing rubrics need to embed greater guidance to support peer-reviewers and elicit meaningful feedback.

Participants felt they lacked the expertise to provide meaningful feedback, which is echoed by other research with ELLs [63]. It was unclear what kind of guidance would best help, and exploring how to implement this support motivated the deployment and evaluation of the tool in our present study.

5 From Early Requirements to App Design and Deployment

Having identified the need for a peer learning support tool for mature ELLs, we present a deployment study that further explores the design requirements for a peer-review platform to support mature ELLs' writing development. The study validates and builds on these four findings from our early study. We have built a collaborative writing support app that implements these initial requirements. We then conducted a short-term deployment study with mature ELLs in an ecologically valid setting ("in the wild"). The study was designed so it implements pedagogical approaches that are common for this context and evaluated our requirements through focus groups and analysis of writing samples collected from the deployment. Methodologically, we follow the same approach as other deployment studies of learning support applications [45], with analysis conducted on data collected both from the artefacts produced by learners, and from qualitative sources (interviews, focus groups, etc.)

We report on the insights gained from this study, particularly connecting mature ELLs approaches and attitudes toward peer feedback mechanisms with the design requirements for interactive learning support tools. We explore how the design of peer-feedback rubrics

influence quality of peer-review and the experiences of mature ELLs in using this tool. To better understand how to support mature ELLs' learning goals within the context of overcoming the challenges they face after resettlement, we answer the following research questions:

R1: Do localized rubrics generate more relevant and accurate feedback than general rubrics?

R2: How can a peer feedback system guide mature ELLs in improving their writing?

R3: Will mature ELLs remain engaged with such a writing support tool over the course of the deployment?

R4: How do mature ELL perceptions of peer-review platforms impact the long-term sustainability of a community-centered approach to writing development?

6 Method

We investigate how the design factors of a writing support tool impact mature ELLs' perceptions of the writing process and their performance on writing tasks. We consider both perceptions and performance to examine the viability of writing tools to provide long-term support in informal learning contexts.

6.1 Participants

Sixteen mature ELLs (Female = 13) participated in this study – four of them having also participated in the formative study. The average age of participants was 38.6 (SD = 6.5). The most commonly spoken language was Farsi (six), followed by Mandarin/Cantonese (four), followed by one participant each for French, Italian, Spanish, Ukrainian, Russian, Korean, Portuguese, and Azari. All participants had completed at least a college diploma or a bachelor's degree, while six has a master's degree and two had completed a PhD. This sample reflects the Canadian immigration system, which favours highly-educated immigrants. Eleven participants were unemployed, three were employed part time and two were employed full time. Improving English for daily life or getting a job was the primary motivator for taking English language classes for eleven participants, followed by preparing for studying (two), passing a test to get certified in a trade or profession (one) and preparing for a citizenship test (one).

We did not collect data on participants' technology proficiency and use of technology for their own (personal) learning activities. However, the educational background typical of skilled immigrants to Canada does not suggest this to be an issue. In fact, both prior research [16] and actuarial data [52] indicate that technology literacy and use among immigrants to Canada is not different than that of Canadian-born users. The only difference is visible in the language barriers manifested when accessing resources (e.g. online services) through such technologies [16].

In addition to the four of the participants that had completed the yearlong field study and who continued with this phase, the remaining twelve participants were recruited from the Language Instruction for Newcomers to Canada (LINC) program. LINC is a government funded program offering free English language classes to recent immigrants. The uneven gender split in this study is representative of the split in LINC classes, of which 72% of the students are female [21]. All students are assessed using the Canadian Language Benchmarks (CLB) standard, which is a three-stage scale describing language proficiency. By stage two, which all our participants were assessed at, individuals can participate in a variety of contexts and independently engage in routine and familiar situations [29]. Therefore, all our participants were in the same English proficiency skill range at the time of our study.

A researcher visited LINC classes in a large, predominantly English-speaking metropolitan area in Canada to invite students to participate in the study. Participants were informed during recruitment that they would receive \$50 CAD and reimbursement for travel expenses to study sites. The researcher was not affiliated with LINC. Both the researcher and the program coordinators facilitating recruitment made it clear that participation was completely voluntary and not a component of their LINC class. The study was deemed low risk and approved by our university's research ethics board.

6.2 Apparatus

We designed a web app informed by the requirements gathered from the field study, grounded in relevant literature [35, 55, 67], and based on the pedagogical guides on peer feedback available in the LINC's teacher guides [76]. The app implements a common peer feedback activity from the LINC guide in the form of free-form text feedback of several types, such as prompting by guiding questions (Figure 3). The feedback is specific to both an essay and writing revisions submitted by other users (Figure 2), which also implement typical LINC activities. We opted to use numerical scores sparingly, as our formative study and prior research [35] suggests that scores may be less valuable to immigrant ELLs than textual feedback. We did not provide specific, fixed forms for low-level aspects such as grammars, as one of the findings from our formative study was that ELLs tend to naturally focus on such aspects. The level of localization for the feedback was similar to that found in the LINC guides. The app did not include teacher feedback, as the focus of our research was on peer feedback, and since one of the findings from our formative study was that mature immigrant ELLs were accepting of peer feedback.

The app runs in any browser but is more suitable for larger screens (e.g. laptops), as it is intended for writing practice. The app does not require special technical capabilities beside the use of common browser found in any up-to-date operating system. In the app, users are paired with an anonymous partner and complete four steps in the peer-review process. The steps are briefly introduced here, and explained in-detail in the Procedure subsection.

Step One: Submit Assignment. Users receive assignment descriptions and submit responses (Figure 1).

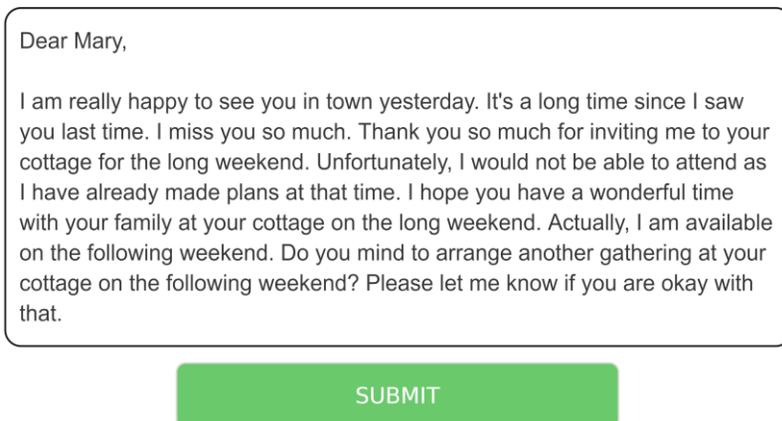


Figure 1. Users receive assignment descriptions and submit responses.

Step Two: Tag Assignment. After submission, users tag their assignments and can also revise (Figure 2).

Please copy and paste parts of your essay into the tags below.

Copy the parts of your response where you convey your excitement about seeing him/her. ADD

I am really happy to see you in town yesterday. It's a long time since I saw you last time.

Copy the parts of your response where you express regret over not being able to accept his/her invitation. ADD

Unfortunately, I would not be able to attend as I have already made plans at that time.

Copy the parts of your response where you suggest an alternative plan to meet. ADD

Actually, I am available on the following weekend. Do you mind to arrange another gathering at your cottage on the following weekend?

SUBMIT

Figure 2: Users copy sections of their assignment under the appropriate tag.

Step Three: Provide feedback to partner. Once the partner submits a response, users can provide feedback (Figure 3).

Did the writer use proper tone for the context of the letter? Which part/s of the letter use improper tone?

The tone was a bit strange in the middle. I feel like it could be more friendly.

Did the writer use a wide range of vocabulary for the task? How can this be improved?

Yes, a lot of words were used but I think there were some mistakes with the grammar.

On a scale of 1 (strongly disagree) to 5 (strongly agree), how well did the writer complete the task? 1 ^
v

On a scale of 1 (strongly disagree) to 5 (strongly agree), how easy was it to follow the writer's flow of thought? 1 ^
v

Does the statement below convey the writer's excitement about seeing the friend? How can the statement be improved?

I am really happy to see you in town yesterday. It's a long time since I saw you last time.

Yes, it does show the excitement.

Does the statement below express the writer's regret over not being able to accept the friend's invitation? How can the statement be improved?

Unfortunately, I would not be able to attend as I have already made plans at that time.

Figure 3: Peer-reviewers first complete a general rubric (top). Peer-reviewers complete a localized rubric built from the tagged component (bottom).

Step 4: Receive feedback from partner and revise. After participants receive feedback from their partners, they can revise and resubmit their responses (Figure 4).

Editing Essay

Review the responses from your partner and edit your essay accordingly

<p>Response</p> <p>Part 1:</p> <p>Free-Form</p> <ol style="list-style-type: none"> 1. Did the letter address all the main points required to complete the task? Which parts of the task are missing? All the parts were addressed. 2. Was the letter organized well that it was easy to understand? What can be done to ensure good flow and organization? Yes, it was well organized but there could have been more paragraphs. 3. Did the ideas of the writer connect well? How can this be improved? More paragraphs would improve the ideas. 	<p>Dear Mary,</p> <p>I am really happy to see you in town yesterday. It's a long time since I saw you last time. I miss you so much. Thank you so much for inviting me to your cottage for the long weekend. Unfortunately, I would not be able to attend as I have already made plans at that time. I hope you have a wonderful time with your family at your cottage on the long weekend. Actually, I am available on the following weekend. Do you mind to arrange another gathering at your cottage on the following weekend? Please let me know if you are okay with that.</p> <div style="text-align: center; margin-top: 10px;"> SUBMIT </div>
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Figure 4: Participants can view their peer-feedback and revise their assignment.

6.3 Instruments

6.3.1 CELPIP grading rubric

An independent instructor specialized in adult ELL instruction but not affiliated with the study or LINC was hired for the study. The instructor derived an assignment grading rubric from the Canadian English Language Proficiency Index Program (CELPIP). CELPIP is a standardized rubric for assessing communication abilities in routine situations such as interacting with co-workers and friends. We focused on such informal writing activities as exclusion from these routine interactions often result in the social marginalization of new immigrants. The rubric consists of four dimensions, scored on a scale of 1-5: Task completion and coherence, format and tone, mechanical convention, and lexical resource.

6.3.2 Assignments

The instructor created three assignments based on the CELPIP exam on topics participants would routinely encounter, listed next:

1. Community centre program: You are interested in enrolling in a program at your community centre. You know that the centre offers art classes, sport activities and social events. Your task is to send an email to the program manager.
2. Responding to an invitation from a friend: You have bumped into a friend in town. He/She has sent you an e-mail inviting you to their cottage for the long weekend. Unfortunately, you cannot come because of a prior engagement.
3. Writing a postcard to a friend: You are on vacation and would like to send a postcard to a good friend.

6.3.3 Feedback assessment

Shute's (2008) feedback taxonomy was used by the instructor to classify the feedback into two categories [58]. Surface or generic feedback such as "well done", or "nothing should be changed" was categorized as "No feedback". "No feedback" items were not analyzed further. Feedback falling under the other types in Shute's taxonomy such as "verification" (informing about correctness) and "elaborated" (providing explanation) were grouped together and are referred to as "relevant" feedback in this study. Meaningful feedback was then evaluated for accuracy. Accuracy was any feedback that correctly identified an issue with the writing. Thus,

each relevant feedback was classified as either accurate or inaccurate. The classification scheme for the feedback is illustrated in Figure 5. We consider this level of granularity as adequate for this study, since the focus of our research was not on the fine-grained analysis of the feedback. Instead, our goal was to gain an understanding of adult immigrant ELL’s high-level, holistic perceptions of peer feedback and collaborative writing systems. Prior research exists on aspects of localized feedback, both for mature ELLs [35] and for school-age ELLs [6, 18].

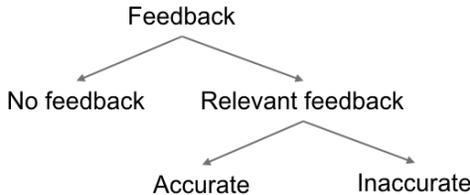


Figure 5: Classification of feedback per Shute’s (2008) taxonomy

6.3.4 Procedure

Participants first attended a session where they completed a demographic questionnaire and the researcher familiarized them with the app. Participants were informed that they would be assigned a partner who was at the same or adjacent LINC level as them. Names of partners on the app were kept anonymous. We decided to maintain anonymity in order to avoid possible confounding effects such as based on gender, ethnicity, or apparent competency, as prior research has shown that, in some cases, these factors play a role in learners’ perception of peer feedback [23, 33, 55]. While partners were assigned as randomly as possible, we avoided pairing participants from the same class (whenever this information was available) to avoid possible unwanted effects of partners identifying each other and communicating outside of the app.

Participants completed three writing assignments, with three days allotted for each assignment. For each assignment, participants were asked to write 100-150 words in response (Figure 1). Each assignment description also included a list of three deliverables that should be present in the assignment. For instance, one of the requirements was that the response to the friend’s invitation assignment should “express regret over not being able to accept his/her invitation”. These writing samples were used to answer R1, R2, and R3. In total, participants used the app remotely for nine days.

After writing their response, the app prompted participants to tag to their writing (Figure 2). Tagging is defined as copying segments of their writing under three tags. Each of the tags was drawn from the three deliverables in the assignment prompt. For instance, participants would have been asked to “Copy the parts of your response where you express regret over not being able to accept his/her invitation.”

Once participants submitted an assignment, the peer-reviewer could view it and provide feedback. Based on the findings from the formative investigation, review was structured so that participants first assessed the writing holistically. This included both free-form and Likert-scale questions on the style, flow, vocabulary use, and overall impression of the writing (Figure 3). These five general questions were derived from the structured rubric:

1. Did the letter address all the main points required to complete the task? Which parts of the task are missing?
2. Was the letter organized well that it was easy to understand? What can be done to ensure good flow and organization?

3. Did the ideas of the writer connect well? How can this be improved?
4. Did the writer use proper tone for the context of the letter? Which part/s of the letter use improper tone?
5. Did the writer use a wide range of vocabulary for the task? How can this be improved?

In the second part of the peer-review, reviewers were prompted to provide more localized feedback (Figure 3). Reviewers were shown the sentences tagged by the writer and asked a corresponding question. For instance, one of the localized questions for the “Responding to an invitation from a friend” task was “Does the statement below express the writer’s regret over not being able to accept the friend’s invitation? How can the statement be improved?” The statement displayed below this question was what the writer had tagged in response to the prompt: “Copy the parts of your response where you express regret over not being able to accept his/her invitation”. Participants were shown both the general and localized peer-feedback and asked to revise their assignment (Figure 4). The revised assignment was not shared with the peer-reviewer.

The accuracy and type of feedback was classified by the instructor for relevancy (does it identify an issue?) and accuracy (is it correct?). The classification was used to determine whether the structure of the peer-review prompted more relevant and accurate feedback to answer R1 (Do localized rubrics generate more relevant and accurate feedback than general rubrics?). The instructor graded each of the responses per the rubric. The accuracy of revisions in the resubmitted assignments was evaluated to answer R2 (How can a peer feedback system guide mature ELLs in improving their writing?). User engagement with the app, as measured by count of assignments submitted, peer-reviews completed, and revisions made, was used to answer R3 (Will mature ELLs remain engaged with such a writing support tool over the course of the deployment?)

Participants returned to the lab for a focus group session, consisting of three to five ELLs. All participants were invited to take part in the focus group, however only those who were available to attend participated. Three focus groups were run with 12 of the participants from the deployment study. Focus groups consisted of three (P2, P4, and P5), four (P9, P10, P11, and P14) and five (P1, P7, P8, P12, and P13) participants. Each session lasted 1-1.5 hours. Groups were led through a semi-structured interview guided by the researcher to answer R4 (How do mature ELL perceptions of peer-review platforms impact the long-term sustainability of a community-centered approach to writing development?). Each session covered four topics: the writing process, giving peer-feedback, receiving peer-feedback, and overall impressions. The writing process focused on task clarity, pre-writing activities, reasons for not completing assignments and disruptiveness to daily life. Giving peer-feedback discussed in-depth the differences between the localized and general rubrics. The receiving feedback section covered helpfulness of feedback, criteria for measuring trust in feedback, opinions on working with a partner and feedback type preferences. Finally, overall impressions asked about design changes to the interface and holistic impressions about the app’s ease of use and usefulness. Focus groups were audio recorded and the transcribed interviews were analyzed to answer R4 (How do mature ELL perceptions of peer-review platforms impact the long-term sustainability of a community-centered approach to writing development?).

7 Results

This section analyzes the writing samples and the focus group data. The accuracy and quality of the peer-review and the revisions to the writing are explored, and engagement with the app over time is measured. Table 1 presents a summary of the research questions and related findings at the end of this section. Themes are drawn and analyzed from the transcribed focus group interviews.

7.1 Analysis of Writing Samples

R1: Do localized rubrics generate more relevant and accurate feedback than general rubrics?

Of the 172 general feedback comments (i.e. from the general rubric), 50 of the comments (29.1%) were relevant (i.e. attempted to identify an issue with the paper), as assessed by the instructor. For the 112 localized feedback comments (i.e. from the localized rubric), 58 (51.8%) of the comments were relevant. A chi-square test shows that this difference in proportion of relevant comments between the general and localized feedback was significant ($X^2(1) = 10.71, p < .01$). The localized rubric elicited more relevant comments, and thus can better sustain a peer-review network. Though developing localized rubrics is more resource intensive as it requires customization for each assignment, localized questions are more likely to prompt feedback that makes relevant suggestions for improvement.

There were 50 relevant comments on the general questions. Of this, 30 (60.0%) were accurate. Of the 58 relevant comments on the localized questions, 41 (70.1%) were correct. A chi-square test indicates that the difference in accuracy between the general and localized feedback was not significant ($X^2(1) = 0.28, p = n.s.$). This suggests that though mature ELLs prefer structure, there is no difference in the accuracy of the feedback they provide between structured and unstructured rubrics. This suggests that even without support, mature ELLs can provide somewhat accurate feedback. A community-based tool has potential to further improve this accuracy, such as by using multiple peer-reviewers to resolve discrepancies in feedback provided.

R2: How can a peer feedback system guide mature ELLs in improving their writing?

Participants made a total of 89 revisions (additions, deletions and substitutions to the original draft) over the three assignments, averaging to 3.6 revisions per resubmitted draft (25 of 39 assignments were resubmitted). 59 revisions were correct or were stylistic changes that preserved correctness (ex. Adding “In addition to” to improve transition). This level of accuracy (66.3%) suggests that mature ELLs do have some ability to distinguish between correct and incorrect feedback, and to implement revisions that improve their writing. However, there is still opportunity for a peer network to better support mature ELLs in identifying accurate feedback and incorporating those changes.

R3: Will mature ELLs remain engaged with such a writing support tool in the long-term?

App engagement decreased over time as measured by the count of participants who submitted assignments, provided feedback, and revised their assignments. In addition, there was a decreasing trend in the number of revisions that participants implemented after receiving feedback. For the first assignment, 65 additions, deletions, and substitutions were made (an average of 4.6 revisions per resubmitted draft). The second assignment consisted of 16 revisions (2.3 revisions per draft) and the third consisted of 8 revisions (2.0 revisions per draft). The drop in engagement over the three assignments indicate that the participants lost motivation or were unable to complete assignments over time. In informal learning contexts where there are no hard deadlines or an instructor to facilitate the completion of assignments, other mechanisms

for maintaining engagement are needed, such as a more open accountability model within peer groups.

7.2 Focus Group Feedback

The analysis of writing samples was complemented by insights gained from interviews with the participants conducted during the focus groups. The interviews were semi-structured, with the researcher guiding discussions around participants’ perceptions of the platform, how they engaged with the learning process, and what could be changed. 38 codes and three themes were drawn by the researcher from the transcribed sessions using inductive thematic analysis, and validated by a researcher not affiliated with the study. Grounded theory makes use of inductive strategies for analyzing qualitative data, where data is iteratively abstracted to identify common themes and patterns [2]. This inductive approach allows for a systemic analysis of qualitative data and links research with theory [60]. The three themes and respective sub-themes, illustrated in Figure 6 are analyzed next to answer R4: How do mature ELL perceptions of peer-review platforms impact the long-term sustainability of a community-centered approach to writing development?

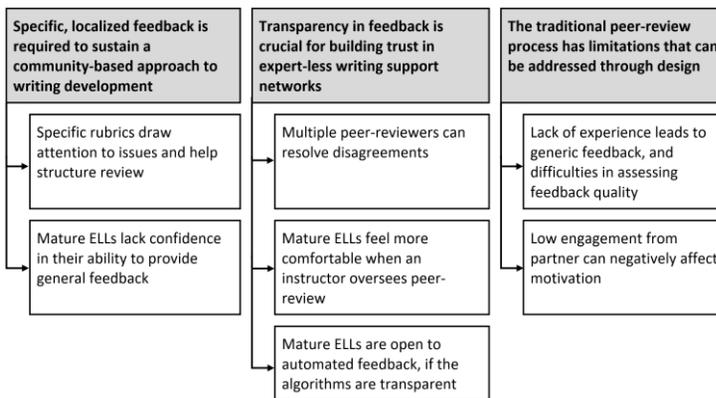


Figure 6: Themes and sub-themes drawn from transcribed focus group interviews.

7.2.1 Theme One: Specific, localized feedback is required to sustain a community-based approach to writing development.

This theme explores how mature ELLs perceive the learning support tools and their preferences for the type of feedback they receive.

Localized rubrics draw attention to issues and help structure review: Participants unanimously preferred the localized, tagged questions over the general questions. P10 explains that receiving general feedback did not help much in providing direction for improvement, while the localized feedback more clearly identified issues: “General sounded just the general and comment not the specific way and specific problem for learning.” P5 notes one of the benefits of the localized questions is that “it helped you with the structure”.

Mature ELLs lack confidence in their ability to provide general feedback: Prompting is helpful for novice writers as it reduces information overload and scaffolds learning. P5 suggests: “Maybe it can be more detailed about what to give feedback, with general, we don’t have experience. But if you say that the structure, the vocabulary ... maybe I can try and think more of this thing, but if you just say that to give your idea we are not teachers in writing so we had to figure out so many problems.” P4 agreed: “When you’re good with something it’s easier to give feedback.”

7.2.2 Theme Two: Transparency in feedback is crucial for building trust in expert-less writing support networks.

This theme focuses on mature ELLs perceptions of feedback sources and analyzes the characteristics of feedback they use to assess reliability.

Multiple peer-reviewers can resolve disagreements: Participants noted that the peer-feedback they received may be inaccurate or not comprehensive. One solution to mitigate incorrect feedback was to have a greater number of partners, in an open discussion board, as stated by P4: “Maybe you could have some comments below and then the other person can judge or say which is better or both side is right. So in my heart I say it’s not right but I follow you.”

Mature ELLs feel more comfortable when an instructor oversees peer-review: P5 suggested that an instructor should oversee disagreements and ensure correctness: “The professor can make a conclusion, who says it more nicer, who’s better.” This is similar to studies with younger ELLs, who prefer having an instructor present during peer-review [41]. Peers serve an important role in keeping learners motivated, but mature ELLs still feel most comfortable if an instructor is available to provide specific guidance. As P12 explains: “It’s quite motivating to have a peer work with you—it’s good to have someone to work together, but I think the most helpful way is to have a professional instructor to help with us on a specific aspect of writing he could maybe give us more correct or accurate instructions.”

Mature ELLs are open to automated feedback, if the algorithms are transparent: Though there was no automated component to the peer-review platform, one focus group discussed their perceptions of automated feedback. P2 brought up trust in automated feedback by stating “I think the partner can be a computer.”, which P5 agreed with: “AI can do everything.” However, participants emphasized they want the automated feedback to provide explanations of errors and to offer suggestions, as stated by P1: “It’s good, but if it can give us more specific feedback, like what word I’m not using correctly, or what structure I’m not using correctly.” P5 added that automated prompts could help when peers overlook issues: “Maybe, maybe my partner don’t know everything. Because if this I think a computer which is fully programmed is better than a partner— or a professor.”

An important feature of feedback mature ELLs value is transparency. Numerical scores without explanation hold little meaning for mature ELLs, as explained by P5: “If I look at the score, I don’t know 4 stands for what. It’s very high or very low. It just depends on my experience, maybe 3 is just medium. So more context for the scores.” P4 agreed and added: “Leave some space for if you say 3, why? Something like that.” This validates the finding from the prior study which hinted that mature ELLs on the job market have less interest in numerical, summative assessment than younger learners in academic contexts. Participants want access to a repository of sample writing responses to guide their own writing. P5 notes: “So we need to see some more models of this so we can memorize.”

Within this theme, four features were suggested for inclusion in collaborative writing apps. First, each learner should have multiple partners. Automated feedback should be transparent and offer suggestions. An instructor should oversee the activities for accuracy. Finally, sample writing should be provided to communicate expectations.

7.2.3 Theme Three: The traditional peer-review process has limitations that can be addressed through design.

This theme covers issues mature ELLs found in the peer-review process and suggests design to address these pain points.

Lack of experience leads to generic feedback, and difficulties in assessing feedback quality: Learners may believe they cannot assess feedback that is generic praise or does not address an issue. P2 reports: “[Partner] said everything is ok. Maybe its ok. But I’m not a professional so maybe I did something wrong.” P1 similarly commented that the feedback was “not enough, most of the time we only heard ‘yes’ ‘yes’.”

Conversely, Mature ELLs may not believe that they have the appropriate skills for reviewing. P5 discusses how a partner perceived to be at a higher level impacted reviewing confidence: “I always give that [generic praise] feedback to my partner, because I can’t find mistake. I think it’s because of my skills. So maybe after some other computer or professor reviewed.” On the receiving end, some felt that their partners were self-censoring negative comments, with P9 mentioning: “I feel like it is so friendly.” While one may expect that peer feedback to be a source of tension, other research with ELL participants (albeit of school age) showed that learners are mindful of others’ feelings and thus avoid harsh assessments when peer-reviewing [63, 66].

This low confidence contrasts our finding that mature ELLs are skilled in providing and assessing accurate feedback.

Therefore, tool design should place more focus more on scaffolding learner confidence, as lack of confidence may be a more significant barrier for mature ELLs than their actual ability.

Low engagement from partner can negatively affect motivation: Further highlighting the importance of affect when interacting with educational technology, unengaged partners impact learner motivation and lead to anxiety. P13, whose partner did not complete most of the tasks, notes: “All the time I was checking [for updates] but [partner] wasn’t so it felt incompletd. I did my part but he or she didn’t. You should use more motivated people because it’s not good, some people think they can do, but they can’t.”

Table 1: Summary of research questions and associated finding

Research Questions	Findings
R1: Do localized rubrics generate more relevant and accurate feedback than general rubrics?	F1: Localized rubrics prompt more relevant feedback. Localized rubrics do not prompt more accurate feedback.
R2: How can a peer feedback system guide mature ELLs in improving their writing?	F2: Mature ELLs can independently implement accurate revisions with some accuracy.
R3: Will mature ELLs remain engaged with such a writing support tool over the course of the deployment?	F3: Engagement decreased over time, due largely to low accountability between peers.
R4: How do mature ELL perceptions of peer-review platforms impact the long-term sustainability of a community-centered approach to writing development?	F4: Specific, localized feedback is required to sustain a community-based approach to writing development.
	F5: Transparency in feedback is crucial for building trust in expert-less writing support networks.
	F6: The traditional peer-review process has limitations that can be addressed through design.

8 Discussion and Design guidelines

When access to educational resources is limited, community-generated support has the potential to serve as a mutually beneficial learning channel. As we have seen in our study, this could be of great benefit for mature immigrant ELLs who are at risk of deskilling and socioeconomic inequality due to their limited language abilities. Based on the findings of our research, we therefore suggest three guidelines for informing the design of collaborative writing support tools for mature ELLs.

DG1: Present learners with diverse sources of transparent feedback in community-based writing support tools where there is little to no instructor presence.

Our mature ELLs reported internal pressure to agree with partner feedback. However, they generally agreed that more peers, or automated feedback to resolve disputes would increase confidence in feedback. All participants wanted an instructor to oversee and intervene as needed. We found perceived authority of feedback source does impact learner trust, but specificity, detail and transparency are also significant factors (F5).

Thus, writing support tools for mature ELLs should combine peer, automated and, if possible, instructor feedback and secondly, design the review process to elicit transparent, formative feedback. Finally, this feedback should be presented without overloading the writer as this may lead to superficial learning [58], while also allowing the writer to judge, validate, and seek clarification on the feedback.

We suggest that designers of peer-review platforms transform automated feedback into suggestions or prompts for reviewers, rather than presenting the feedback as an assessment to the writer. Peer-reviewers can then provide context to the summative, automated feedback. MindWare is a writing system that provides automated feedback through rankings relative to a large database [20]. The system highlights sentences in the essay that could be improved, but does not provide guidance on how to improve [20]. A possible implementation of this guideline in our system would be to generate automated feedback similar to that used in MindWare, and include it as part of the peer-review rubric to prompt feedback. Peer-reviewers will benefit from the highly-structured review process that directs attention to problems. Additionally, the writer will benefit from formative, contextualized feedback reviewers provide on the summative, automated assessment.

DG2: Writing support tools for mature ELLs should foster community through collaborative, semi-structured group discussions.

While in our study we have opted for an anonymous mechanism for peer feedback in order to avoid confounds (as discussed in Section 6.3.4), participants suggested the value of fostering a sense of community in supporting each other's learning goals. This confirms prior research that ELLs appreciate the community and social aspects of collaborative language learning, as observed both for mature immigrant ELLs [67] as well as for school-age ESL students [66].

Prior research has shown that motivation is a key factor to sustain ELLs learning goals. In some contexts, e.g. recently-immigrant children learning, intrinsic motivation maybe lacking – in such settings extrinsic motivation such as game helped overcome these barriers [62]. However, for mature immigrants, the motivation is grounded in socio-economic pressures and desires [67]. Yet, in our research we revealed that fostering a sense of community motivates learners to complete tasks, and helps resolve disagreements. Additionally, multiple peer-reviewers prompt learners to consider their writing from a reader's perspective, a skill that expert writer's possess [56]. Group peer-review also provides access to model assignments that reviewers can benefit from in their own writing [36]. We recommend that designers of writing

support tools approach these platforms with the mindset of designing for collaboration, not simply for interaction. When learners discuss and debate, learning outcomes are improved [8].

Structured review alone, as done in many peer-review platforms, does not lead to a sense of community (F6). An open discussion space is necessary for fostering collaboration by allowing learners to exchange praise and support and for establishing a social presence [72]. A common identity through shared goals and values is also important for creating a sense of community [61]. In learning communities, ELLs adopt goals and viewpoints of their peers, like taking a collaborative approach to peer-review when writing is viewed as a team-based process rather than an individual product [39]. Additionally, peer-reviewers produce higher quality feedback when they can compare multiple pieces of work (F2), as this provides them with a benchmark for performance [5].

An online peer-review platform should incorporate both structured review while allowing for unstructured, open discussion within a group to promote collaboration. Social media platforms, such as Facebook, can develop community in ELL writing courses through use of the Like button and emoticons to convey feelings that were not captured in the review [57]. However, unstructured communication channels create additional challenges. Motivation for high ability ELLs can decrease when they are paired with lower ability students [25], as we also discovered. Thus, community based peer-review platforms should consider learners' levels when forming groups. Prompting students with guiding questions and hints throughout the writing process can help build a sense of community, as was suggested by our focus groups and also found in literature with younger ELLs [39].

Our study was limited to a sample of 16 participants, and as such, we did not observe issues of conflict, strong disagreement, or tension related to the peer feedback, which may appear in other contexts [23, 55, 73]. As we highlighted earlier, prior research suggests that such issues may not always occur with peer feedback tools for ELLs [66, 67]. Nevertheless, as this was out of the scope of our research, we recommend further research into the design of appropriate mechanism to mitigate disagreement if such issues are to be anticipated.

DG3: Learning supports must be specific enough to support learners in identifying localized issues and build confidence, while also being dynamic enough to minimize the need for an instructor.

In paper-based peer-review, training ELLs to review improves feedback quality [37, 42, 43], suggesting that scaffolding can improve ELLs' reviewing skills. Rubrics can prompt formative feedback and communicate task expectations (F1). Additionally, providing questions to structure peer-review leads to reviewers identifying more errors [4], and increased formative feedback [1]. Rubrics, then, can scaffold meaningful peer-review. General rubrics reduce the time an instructor must spend on adapting and creating rubrics for new assignments [27]. However, we found that localized rubrics prompt more relevant feedback (F4). Thus, there is a trade-off between instructor involvement and peer-review value.

Peer-review systems generally require fixed rubrics, making scaling a challenge (F6). ARISE, a peer-review platform, uses automated analysis to generate dynamic rubrics (ex. The system may ask the reviewer to assess complexity of sentences over 15 words) [65]. While this rule-based approach works for structural aspects, other approaches are needed for drawing attention to content issues. We proposed one solution in our app, by prompting learners to tag their writing under instructor-defined categories drawn from the assignment descriptions. With this, we generated domain localized rubrics customized for each assignment with minimal instructor involvement.

We discovered that mature ELLs can provide and assess feedback with some accuracy (60-70%), but report a lack in confidence. This finding underscores the importance of designing scaffolds not just for technical, but affective development too. One of the strategies employed by skilled adult ELLs is strong regulation of affective difficulties [46]. One way to scaffold affective development, as we did, was with localized rubrics. that improve confidence when reviewing. Other mechanisms, such as positive reinforcement during review, can also provide affective support and improve work quality. Positive affect in feedback can also improve the accuracy of revisions due to lowered stress, in comparison with affectively neutral feedback [47]. Future challenges remain in designing peer-review rubrics and scaffolds that further reduce instructor burden while still scaffolding reviewers in identifying issues and articulating meaningful feedback.

9 Conclusion

Highly-skilled immigrants often face a challenging search for employment and community, and are at high risk of facing social, cultural, and economic marginalization. Formal structures frequently fail to provide adequate support in preparing new immigrants, especially those no longer in school, for achieving their goals. Turning to the community for support has the potential to overcome the systemic barriers to success that these immigrants face. Our research focused on immigrants to Canada. However, many of the peer learning aspects are likely generalizable to other industrialized countries that have a similar skilled worker entry program for accepting highly educated immigrants.

We explored the viability of peer-review based writing support tools to provide long-term support in informal learning contexts. We conducted an “in-the-wild” evaluation of a collaborative learning tool for mature ELLs to understand both their performance and their perceptions of the peer-review process. From this we drew guidelines for developing a group-based peer-review network rather than a dyadic peer review system.

From our findings, we suggest three recommendations for designers of writing support tools for sustainable, semi-autonomous learning environments. We suggest mature ELLs should be presented with feedback from diverse sources where the justification is transparent, community should be fostered through open-ended discussion rather than imposing a formal structure for the peer-review, and finally, localized guidance is required for improving both technical and affective skills.

For newcomers to a country, the process of learning language is also a process of reshaping identity and developing a sense of self within a new community [31]. Therefore, design for language learning should consider the wider, postcolonial context in which the language acquisition is situated [30]. We found that our mature ELLs are not “students” in the traditional sense, but rather, they are invested life-long learners who actively pursue new skills that bring them closer to their goals. As such, language learning tools should also foster positive self-growth. Mature ELLs should feel confident in making mistakes, providing honest feedback, and engaging in collaborative knowledge building in these spaces. When formal structures are unable to provide new immigrants with necessary resources, a collaborative learning platform that incorporates our guidelines can promote the reciprocal sharing of language learning guidance by leveraging skills within a network of peers.

References

- [1] Baker, K.M. 2016. Peer review as a strategy for improving students' writing process. *Active Learning in Higher Education*. 17, 3 (2016), 179–192. DOI:<https://doi.org/10.1177/1469787416654794>.
- [2] Braun, V. and Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 3, 2 (Jan. 2006), 77–101. DOI:<https://doi.org/10.1191/1478088706qp063oa>.
- [3] Bull, S., Greer, J., McCalla, G. and Kettel, L. 2001. Help-seeking in an asynchronous help forum. *Proceedings of Workshop on Help Provision and Help Seeking in Interactive Learning Environments, International Conference on Artificial Intelligence in Education* (San Antonio, TX, USA, 2001).
- [4] Butterfield, E.C., Hacker, D.J. and Albertson, L.R. 1996. Environmental, cognitive, and metacognitive influences on text revision: Assessing the evidence. *Educational Psychology Review*. 8, 3 (Sep. 1996), 239–297. DOI:<https://doi.org/10.1007/BF01464075>.
- [5] Cambre, J., Klemmer, S. and Kulkarni, C. 2018. Juxtapaper: Comparative Peer Review Yields Higher Quality Feedback and Promotes Deeper Reflection. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18* (Montreal QC, Canada, 2018), 1–13.
- [6] Camhi, P.J. |Ebsworth 2008. Merging a Metalinguistic Grammar Approach with L2 Academic Process Writing: ELLs in Community College. *TESL-EJ*. 12, 2 (Sep. 2008).
- [7] Canada to admit nearly 1 million immigrants over next 3 years | CBC News: 2017. <https://www.cbc.ca/news/politics/immigration-canada-2018-1.4371146>. Accessed: 2018-08-08.
- [8] Chi, M.T.H. and Wylie, R. 2014. The ICAP Framework: Linking Cognitive Engagement to Active Learning Outcomes. *Educational Psychologist*. 49, 4 (Oct. 2014), 219–243. DOI:<https://doi.org/10.1080/00461520.2014.965823>.
- [9] Cho, Y.H. and Cho, K. 2011. Peer reviewers learn from giving comments. *Instructional Science*. 39, 5 (Sep. 2011), 629–643. DOI:<https://doi.org/10.1007/s11251-010-9146-1>.
- [10] Connor, U. 1996. *Contrastive Rhetoric: Cross-Cultural Aspects of Second-Language Writing*. Cambridge University Press,.
- [11] Crossley, S.A. and McNamara, D.S. 2009. Computational Assessment of Lexical Differences in L1 and L2 Writing. *Journal of Second Language Writing*. 18, 2 (Jun. 2009), 119–135. DOI:<https://doi.org/10.1016/j.jslw.2009.02.002>.
- [12] Cumming, A. 1991. *Identification of current needs and issues related to the delivery of adult ESL instruction in British Columbia*. Ministry of Provincial Secretary and Ministry Responsible for Multiculturalism and Immigration.
- [13] Dean, J.A. and Wilson, K. 2009. 'Education? It is irrelevant to my job now. It makes me very depressed ...': exploring the health impacts of under/unemployment among highly skilled recent immigrants in Canada. *Ethnicity & Health*. (Mar. 2009). DOI:<https://doi.org/10.1080/13557850802227049>.
- [14] Deci, E.L. 1975. Conceptualizations of Intrinsic Motivation. *Intrinsic Motivation*. E.L. Deci, ed. Springer US. 23–63.
- [15] Demmans Epp, C. 2018. Developing an Adaptive Mobile Tool to Scaffold the Communication and Vocabulary Acquisition of Language Learners. *Handbook of Mobile Teaching and Learning*. (2018), 1–26. DOI:https://doi.org/10.1007/978-3-642-41981-2_92-1.
- [16] Demmans Epp, C. 2017. Migrants and Mobile Technology Use: Gaps in the Support Provided by Current Tools. *Journal of Interactive Media in Education*. 2017, 1 (2017).
- [17] Derwing, T.M., Waugh, E. and Institute for Research on Public Policy 2012. *Language skills and the social integration of Canada's adult immigrants*. Institute for Research on Public Policy.
- [18] Early, J.S. and Sady, C. 2014. A study of a multiple component feedback approach to substantive revision for secondary ELL and multilingual writers. *Reading and Writing*. 27, 6 (Jul. 2014), 995–1014. DOI:<https://doi.org/10.1007/s11145-013-9483-y>.
- [19] Edwards, A. 2018. *Wars, violence and persecution uprooted record numbers of men, women and children worldwide last year*. UNHCR Refugee Agency Report.
- [20] Elouazizi, N., Oberg, G. and Birol, G. 2018. Learning Technology-enabled (Meta)-Cognitive Scaffolding for Enabling Students to Learn Aspects of Written Argumentation. *8th edition of the International Workshop on Personalization Approaches in Learning Environments (PALE)* (Singapore, 2018), 7–11.
- [21] Evaluation of the Language Instruction for Newcomers to Canada (LINC) Program: 2011. <https://www.canada.ca/en/immigration-refugees-citizenship/corporate/reports-statistics/evaluations/language-instruction-newcomers-canada-2010/intro.html#a2>. Accessed: 2018-09-18.
- [22] Ferrer, A., Green, D.A. and Riddell, W.C. 2006. The Effect of Literacy on Immigrant Earnings. *Journal of Human Resources*. XLI, 2 (Mar. 2006), 380–410. DOI:<https://doi.org/10.3368/jhr.XLI.2.380>.
- [23] Fithriani, R. 2018. Cultural Influences on Students' Perceptions of Written Feedback in L2 Writing. *Journal of Foreign Language Teaching and Learning*. 3, 1 (2018). DOI:<https://doi.org/10.18196/ftl.3124>.
- [24] Foong, E., Dow, S.P., Bailey, B.P. and Gerber, E.M. 2017. Online Feedback Exchange: A Framework for Understanding the Socio-Psychological Factors. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17* (Denver, Colorado, USA, 2017), 4454–4467.

- [25] Ge, Z. 2011. Exploring e-learners' perceptions of net-based peer-reviewed English writing. *International Journal of Computer-Supported Collaborative Learning*, 6, 1 (Mar. 2011), 75–91. DOI:<https://doi.org/10.1007/s11412-010-9103-7>.
- [26] Gibson, A., Aitken, A., Sándor, Á., Buckingham Shum, S., Tsingos-Lucas, C. and Knight, S. 2017. Reflective Writing Analytics for Actionable Feedback. *Proceedings of the Seventh International Learning Analytics & Knowledge Conference* (New York, NY, USA, 2017), 153–162.
- [27] Goldin, I.M. and Ashley, K.D. 2012. Eliciting formative assessment in peer review. *Journal of Writing Research*, 4, 2 (Nov. 2012), 203–237. DOI:<https://doi.org/10.17239/jowr-2012.04.02.5>.
- [28] Government of Canada, S.C. 2007. *Immigrants' perspectives on their first four years in Canada: Highlights from three waves of the Longitudinal Survey of Immigrants to Canada - ARCHIVED*.
- [29] Hajer, A. and Kaskens, A.-M. 2012. *Canadian Language Benchmarks: English as a Second Language for Adults*. Citizenship and Immigration Canada.
- [30] Irani, L., Vertesi, J., Dourish, P., Philip, K. and Grinter, R.E. 2010. Postcolonial computing: a lens on design and development. *Proceedings of the 28th international conference on Human factors in computing systems - CHI '10* (Atlanta, Georgia, USA, 2010), 1311.
- [31] Janda, K. 2007. *The Needs of Adult ESL Learners*. Athabasca University.
- [32] Klassen, C. and Burnaby, B. 1993. "Those Who Know": Views on Literacy among Adult Immigrants in Canada. *TESOL Quarterly*, 27, 3 (1993), 377. DOI:<https://doi.org/10.2307/3587472>.
- [33] Larrotta, C. and Chung, H. 2020. Foreign-born TESOL Instructors Assisting Adult Immigrant Learners to Develop Civic Literacy Skills: A Pen Pal Project. *International Journal of Education and Literacy Studies*, 8, 2 (May 2020), 1. DOI:<https://doi.org/10.7575/aiac.ijels.v.8n.2p.1>.
- [34] Liaqat, A., Akcayir, G., Epp, C.D. and Munteanu, C. 2019. Mature ELLs' Perceptions Towards Automated and Peer Writing Feedback. *Transforming Learning with Meaningful Technologies* (Sep. 2019), 266–279.
- [35] Liaqat, A. and Munteanu, C. 2018. Towards a Writing Analytics Framework for Adult English Language Learners. *In Proceedings of the Seventh International Learning Analytics & Knowledge Conference (LAK '17)* (Sydney, Australia, 2018).
- [36] Lin, W.-C. and Yang, S.C. 2011. Exploring Students' Perceptions of Integrating Wiki Technology and Peer Feedback into English Writing Courses. *English Teaching: Practice and Critique*, 10, 2 (Jul. 2011), 88–103.
- [37] Liou, H.-C. and Peng, Z.-Y. 2009. Training effects on computer-mediated peer review. *System*, 37, 3 (Sep. 2009), 514–525. DOI:<https://doi.org/10.1016/j.system.2009.01.005>.
- [38] Littleton, W. 1984. Foreign and Second Language Learning: Language Acquisition Research and its Implications for the Classroom. *Canadian Modern Language Review*, 45, 1 (1984), 191–192. DOI:<https://doi.org/10.3138/cmlr.45.1.191>.
- [39] Lockhart, C. and Ng, P. 1995. Analyzing Talk in ESL Peer Response Groups: Stances, Functions, and Content. *Language Learning*, 45, 4 (1995), 605–55.
- [40] Mathews-Aydinli, J. 2008. Overlooked and Understudied? A Survey of Current Trends in Research on Adult English Language Learners. *Adult Education Quarterly*, 58, 3 (May 2008), 198–213. DOI:<https://doi.org/10.1177/0741713608314089>.
- [41] Mendonça, C.O. and Johnson, K.E. 1994. Peer Review Negotiations: Revision Activities in ESL Writing Instruction. *TESOL Quarterly*, 28, 4 (1994), 745–769. DOI:<https://doi.org/10.2307/3587558>.
- [42] Min, H.-T. 2016. Effect of teacher modeling and feedback on EFL students' peer review skills in peer review training. *Journal of Second Language Writing*, 31, (Mar. 2016), 43–57. DOI:<https://doi.org/10.1016/j.jslw.2016.01.004>.
- [43] Min, H.-T. 2006. The effects of trained peer review on EFL students' revision types and writing quality. *Journal of Second Language Writing*, 15, 2 (Jun. 2006), 118–141. DOI:<https://doi.org/10.1016/j.jslw.2006.01.003>.
- [44] Munteanu, C., Lumsden, J., Fournier, H., Leung, R., D'Amours, D., McDonald, D. and Maitland, J. 2010. ALEX: Mobile Language Assistant for Low-literacy Adults. *Proceedings of the 12th International Conference on Human Computer Interaction with Mobile Devices and Services* (New York, NY, USA, 2010), 427–430.
- [45] Munteanu, C., Molyneaux, H., Maitland, J., McDonald, D., Leung, R., Lumsden, J. and Fournier, H. 2012. Tale of Two Studies: Challenges in Field Research with Low-literacy Adult Learners in a Developed Country. *CHI '12 Extended Abstracts on Human Factors in Computing Systems* (New York, NY, USA, 2012), 489–504.
- [46] Naiman, N. ed. 1996. *The good language learner*. Multilingual Matters.
- [47] Nguyen, T.T.D.T., Garncarz, T., Ng, F., Dabbish, L.A. and Dow, S.P. 2017. Fruitful Feedback: Positive Affective Language and Source Anonymity Improve Critique Reception and Work Outcomes. *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing - CSCW '17* (Portland, Oregon, USA, 2017), 1024–1034.
- [48] Nicol, D., Thomson, A. and Breslin, C. 2014. Rethinking feedback practices in higher education: a peer review perspective. *Assessment & Evaluation in Higher Education*, 39, 1 (Jan. 2014), 102–122. DOI:<https://doi.org/10.1080/02602938.2013.795518>.
- [49] Pawlikowska-Smith, G. 2002. *Canadian Language Benchmarks 2000: Theoretical Framework*.
- [50] Peerceptiv - Data Driven Peer Assessment: <http://www.peerceptiv.com/wordpress/>. Accessed: 2018-01-21.

- [51] Perin, D. and Lauterbach, M. 2018. Assessing Text-Based Writing of Low-Skilled College Students. *International Journal of Artificial Intelligence in Education*. 28, 1 (Mar. 2018), 56–78. DOI:<https://doi.org/10.1007/s40593-016-0122-z>.
- [52] Plante, J. 2010. *Characteristics and labour market outcomes of internationally-educated immigrants*. Technical Report #Report 81-595-M No. 084. Statistics Canada.
- [53] Robinson, J. and Selman, M. 1996. *Partnerships in learning: teaching ESL to adults*. Pippin Pub.
- [54] Roscoe, R.D. and McNamara, D.S. 2013. Writing pal: Feasibility of an intelligent writing strategy tutor in the high school classroom. *Journal of Educational Psychology*. 105, 4 (2013), 1010–1025. DOI:<https://doi.org/10.1037/a0032340>.
- [55] Saeed, M.A., Ghazali, K. and Aljaberi, M.A. 2018. A review of previous studies on ESL/EFL learners' interactional feedback exchanges in face-to-face and computer-assisted peer review of writing. *International Journal of Educational Technology in Higher Education*. 15, 1 (Dec. 2018), 6. DOI:<https://doi.org/10.1186/s41239-017-0084-8>.
- [56] Schriver, K.A. 1989. Evaluating text quality: the continuum from text-focused to reader-focused methods. *IEEE Transactions on Professional Communication*. 32, 4 (Dec. 1989), 238–255. DOI:<https://doi.org/10.1109/47.44536>.
- [57] Shih, R.-C. 2011. Can Web 2.0 technology assist college students in learning English writing? Integrating Facebook and peer assessment with blended learning. *Australasian Journal of Educational Technology*. 27, 5 (Aug. 2011). DOI:<https://doi.org/10.14742/ajet.934>.
- [58] Shute, V.J. 2008. Focus on Formative Feedback. *Review of Educational Research*. 78, 1 (Mar. 2008), 153–189. DOI:<https://doi.org/10.3102/0034654307313795>.
- [59] Silva, T. 1993. Toward an Understanding of the Distinct Nature of L2 Writing: The ESL Research and Its Implications. *TESOL Quarterly*. 27, 4 (Dec. 1993), 657–677. DOI:<https://doi.org/10.2307/3587400>.
- [60] Smith, J.A., Harre, R. and Langenhove, L.V. 1995. *Rethinking Methods in Psychology*. SAGE.
- [61] Sun, N., Rosson, M.B. and Carroll, J.M. 2018. Where is Community Among Online Learners?: Identity, Efficacy and Personal Ties. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18* (Montreal QC, Canada, 2018), 1–13.
- [62] Tewari, A., Goyal, N., Chan, M.K., Yau, T., Canny, J. and Schroeder, U. 2010. SPRING: speech and pronunciation improvement through games, for Hispanic children. *Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development - ICTD '10* (London, United Kingdom, 2010), 1–11.
- [63] Tian, L. and Li, L. 2018. Chinese EFL learners' perception of peer oral and written feedback as providers, receivers and observers. *Language Awareness*. 27, 4 (Oct. 2018), 312–330. DOI:<https://doi.org/10.1080/09658416.2018.1535602>.
- [64] Veronis, L., Tabler, Z. and Ahmed, R. 2018. Syrian Refugee Youth Use Social Media: Building Transcultural Spaces and Connections for Resettlement in Ottawa, Canada. *Canadian Ethnic Studies*. 50, 2 (2018), 79–99. DOI:<https://doi.org/10.1353/ces.2018.0016>.
- [65] Vista, A., Care, E. and Griffin, P. 2015. A new approach towards marking large-scale complex assessments: Developing a distributed marking system that uses an automatically scaffolding and rubric-targeted interface for guided peer-review. *Assessing Writing*. 24, Complete (2015), 1–15. DOI:<https://doi.org/10.1016/j.asw.2014.11.001>.
- [66] Vorobel, O. and Kim, D. 2017. Adolescent ELLs' collaborative writing practices in face-to-face and online contexts: From perceptions to action. *System*. 65, (Apr. 2017), 78–89. DOI:<https://doi.org/10.1016/j.system.2017.01.008>.
- [67] Wang, W. 1999. Age and Second Language Acquisition in Adulthood: The Learning Experiences and Perceptions of Women Immigrants. *TESL Canada Journal*. 16, 2 (Jun. 1999), 01. DOI:<https://doi.org/10.18806/tesl.v16i2.715>.
- [68] Waring, H.Z. and Yu, D. 2018. Life outside the classroom as a resource for language learning. *The Language Learning Journal*. 46, 5 (Oct. 2018), 660–671. DOI:<https://doi.org/10.1080/09571736.2016.1172332>.
- [69] Wauck, H., Yen, Y.-C. (Grace), Fu, W.-T., Gerber, E., Dow, S.P. and Bailey, B.P. 2017. From in the Class or in the Wild?: Peers Provide Better Design Feedback Than External Crowds. (Feb. 2017), 5580–5591.
- [70] Yoon, K. 2017. Korean Migrants' Use of the Internet in Canada. *Journal of International Migration and Integration*. 18, 2 (May 2017), 547–562. DOI:<https://doi.org/10.1007/s12134-016-0487-8>.
- [71] Zhang, C. and Zheng, G. 2013. Supporting adult learning: enablers, barriers, and services. *Proceedings of the 13th annual ACM SIGITE conference on Information technology education - SIGITE '13* (Orlando, Florida, USA, 2013), 151.
- [72] Zhao, H., Sullivan, K.P.H. and Mellenius, I. 2014. Participation, interaction and social presence: An exploratory study of collaboration in online peer review groups. *British Journal of Educational Technology*. 45, 5 (Sep. 2014), 807–819. DOI:<https://doi.org/10.1111/bjet.12094>.
- [73] Zhu, Q. and Carless, D. 2018. Dialogue within peer feedback processes: clarification and negotiation of meaning. *Higher Education Research & Development*. 37, 4 (Jun. 2018), 883–897. DOI:<https://doi.org/10.1080/07294360.2018.1446417>.
- [74] Ziegler, M.F., Paulus, T. and Woodside, M. 2014. Understanding Informal Group Learning in Online Communities Through Discourse Analysis. *Adult Education Quarterly*. 64, 1 (Feb. 2014), 60–78. DOI:<https://doi.org/10.1177/0741713613509682>.

- [75] 2017. *Immigration in Ontario: Achieving best outcomes for newcomers and the economy*. Institute for Competitiveness and Prosperity.
- [76] 2010. *LINC 5-7 Classroom Activities*.

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