
Learning to Reflect on Challenging Experiences: An AI Mirroring Approach

Simon Buckingham Shum

Connected Intelligence Centre
University of Technology Sydney
Sydney, NSW 2007, AUS
Simon.BuckinghamShum@uts.edu.au

Cherie Lucas

School of Pharmacy, Grad. School of Health
University of Technology Sydney
Sydney, NSW 2007, AUS
Cherie.Lucas@uts.edu.au

ABSTRACT¹

As citizens are confronted by major societal changes, they find their assumptions being challenged and their identities threatened, bringing the risk that they retreat to like-minded ‘bubbles’ rather than ask whether they might have something to learn. Algorithmically driven media platforms exacerbate this process by amplifying cognitive biases and polarizing debate. This paper argues for a distinctive role that Artificial Intelligence (AI) can play, by holding up a metaphorical ‘mirror’ to online writers, with carefully designed feedback making them more aware of, and reflective about, their reactions and approaches to challenging situations. As an example, we describe a web application that uses Natural Language Processing to annotate written accounts of personal responses to challenging experiences, highlighting where the author appears to be reflecting shallowly or deeply. This open source tool is already in use by students to help them make sense of work placement challenges they encounter, but could find wider application. Our vision is that such tools could make citizens more self-aware of their biases, making them less reactive, and more open to new perspectives when their assumptions are challenged.

KEYWORDS

Reflection; Identity; Bias; Learning; Reflective Writing; Natural Language Processing; Automated Feedback.

AI MIRRORS TO PROVOKE REFLECTION

“The basis of our argument is that psychological distress—defined as a sense of meaninglessness that stems from anxious uncertainty—stimulates adherence to extreme ideologies.” [14]

As this workshop demonstrates, Artificial Intelligence (AI) could potentially play numerous roles in reducing bias and discrimination, and raising the quality of public discourse. In this short paper, we argue for a distinctive role that AI can play, which is to hold up a metaphorical ‘mirror’ in the form of feedback to make citizens more aware of, and reflective about, their reactions and approaches to challenging experiences, and how they share them with others.

As society undergoes radical changes, many people are struggling to adapt: their assumptions and worldviews are challenged, and their identities threatened. Migration, automation, urbanization, climate change, financial crashes, shifting moral codes, and now the COVID-19 pandemic, are triggering defensive reactions, as people perceive threats to their way of life. We have seen a profound impact: fragmenting communities, leading to dysfunctional public debate, and the rise of extremist politics that prey on these fears.

Popular media [3] and academic scholarship [14] is documenting citizens’ psychological retreat from change at many scales. Change is scaring and angering many people as they experience the loss of the values, people, jobs and other features of their culture. Recent political events around the world, and psychological research into how people form their views, demonstrates that while facts, knowledge and rational argument are critical to learning and debate, many people – including the highly educated – will not be argued into surrendering entrenched positions, including their firmly held beliefs and values.

MAKING SENSE OF CHANGE REQUIRES REFLECTION

However, while these experiences cause some people to retreat, others respond differently, as they recognise that prior assumptions no longer hold. Even if one is unwilling to shift, an unexpectedly positive personal experience can destabilize assumptions and open someone to change. Consider the white supremacist who experiences care or compassion from an immigrant; the homophobic parent whose child turns out to be gay; the polarized voters who find they have much more in common than they thought, once they make space to listen to each other as people, thus considering the views and perspectives of others and their situations.

Whatever the process, the re-humanization of ‘the other’ is central, a well-known dynamic for conflict resolution. Mediators have developed an array of approaches to facilitating dialogue in conflict situations, but trained mediators are clearly a scarce resource. Our interest is in whether technology opens up new dimensions to the question of how individuals become aware of, reflect on, and potentially shift their assumptions and attitudes.

REFLECTING IS HARD WORK, BUT CAN BE LEARNED

In learning contexts, we know quite a lot about how to scaffold this process. In experiential learning for academic or professional development, experiences are designed precisely to provoke such reflection. Simulations, for example, prepare students to cope with their instinctive reactions to people and dilemmas by immersing them in authentic scenarios. In professional life, the complexity of the problems confronting society requires experts from diverse disciplines to work together, often requiring them to ‘unlearn’ some of their assumptions about how work should be done, and what success looks like. Executive coaches support this process for individuals and teams [10].

We propose that educators and coaches engaged in diverse forms of learning — both formal and informal, academic and professional — have a critical role to play in reversing the sense of personal and societal disintegration. Helping people make sense of their thoughts, feelings, reactions and approaches when stretched out of their comfort zones is core business for educators and coaches. Suitably supported, honest reflection makes it safe to question assumptions and consider change, but we also know that this is often difficult to teach, and challenging to learn.

In sum, our argument is that in all spheres of life, across ages and stages, we need to develop strategies to become deeper reflectors. However, while we know there is nothing as valuable as detailed coaching feedback to build this capacity, this is a scarce, costly skillset and labor-intensive. The practical consequence is that most students and leaders do not understand how to reflect deeply, and do not receive good feedback.

EXAMPLE: ANNOTATING REFLECTIVE WRITING

It is here – the costs of providing personal feedback on reflections – that AI could be help to equip citizens to gain deeper insights into themselves, and the situations/people they find most challenging. While there are various ways to express one’s thoughts and feelings, *writing* is arguably the most widely used ‘window’ onto the mind, when we look at practice in both education and professional development. As any blogger or diary writer will attest, the *act of writing* is also a mirror to the learner, helping them clarify what they really want to say: “How do I know what I think until I hear myself say it?” [15].

Reflective Writing

Reflective writing is your response to experience, opinions, events or new information, as well as your response to your thoughts and feelings.

Reflective writing allows you explore your learning and to make meaning out of what you study.

It gives you the opportunity to gain self-knowledge, as well as better understanding what you are learning.

Reflective Writing is a strategy used in education and many professions to help learners, professionals and leaders make sense of challenging experiences, and prepare for the future. It integrates “head and heart”: valuing not only technical/academic knowledge, but how this interplays with experiential/professional ways of knowing, and recognising the fact that learning and working engage our emotions and feelings.

In sharp contrast to conventional academic, business or technical analysis, the focus in such writing is not on persuading the reader, or demonstrating mastery of a topic. In reflective writing, one writes in the first person, typically describing a critical incident that was surprising or challenging, the thoughts, beliefs, feelings and emotions this gave rise to, how prior beliefs may have been challenged, and how one is changing as a result, to help them handle similar situations when they next arise.

Our work to date has developed Natural Language Processing (NLP) to detect the presence of textual features that signal these hallmark ‘moves’ in reflection, opening the possibility for large scale, instant, personalised feedback on personal reflections about challenging experiences. We now describe the current state of this approach, and its delivery as a web application.

UNDERLYING CONCEPTUAL MODEL

In our previous work we have detailed how scholarship into the teaching and learning of reflective writing provides key insights into the hallmarks of effective reflection, and reflective writing (see sidebar). This has enabled us to develop rule-based NLP tuned to detecting corresponding textual features [9] with more recent work investigating machine learning approaches [11].

Fig. 1 shows the framework [9] in which the horizontal dimension represents a narrative-like sequence of “rhetorical moves” that one can find in texts, while the vertical dimension models the depth of reflection. We found (horizontal dimension) that rhetorical moves announce a personal response to a learning situation (*CONTEXT*), acknowledge why this was novel, surprising or in some way confronting (*CHALLENGE*), and indicate how this experience has provoked change in some way with regard to the future (*CHANGE*).

The intersections of depth and sequential dimensions represent the possible stages through which the text moves and the linguistic features used to realise these stages — from ‘shallow’ impressionistic description to ‘deeper’ future-minded intentional statements. The framework’s prompt questions (in each cell) are designed to encourage the writer to move from ‘shallow’ to ‘deeper’ levels of reflection.

Figure 1: Conceptual framework underpinning the AcaWriter reflective writing feedback tool [9]. This is a distillation of the literature on the teaching and learning of reflective writing in educational contexts.

Depth	Intention						What change is likely to lead to future benefits?
	Integration			What impact on my goals/aspirations?	What other ideas could I use to change myself?	How do others address these challenges?	How can I learn from other perspectives?
	Internalisation		What do these feeling say about me?	How is this a problem that challenges me?	Why do I need to change?	How can I change?	
	Interpretation	What does it mean for me?	Why do I feel this way?				
	Impression	What do I notice about my situation?					
		Thoughts	Feelings	Challenge	Self critique	Potential solution	Learning opportunity
CONTEXT			CHALLENGE			CHANGE	
Narrative							

NLP FOR REFLECTIVE TEXTUAL FEATURES

This paper does not focus on the methodology and technology for developing and validating NLP capable of detecting sentences that match different locations in the Fig. 1 framework – for details see [6, 9, 11].

THE ACAWRITER USER EXPERIENCE

This NLP capability has been integrated into a web application called AcaWriter, in order to provide instant feedback to writers on their reflective writing. An overview is presented in [5], and an accessible introduction for students and educators is presented in an orientation website [2]. Examples of automated feedback are shown in Fig. 2, in which a pharmacy student is receiving feedback on their draft reflection [12]. An example closer to this workshop’s focus is in Fig. 3, showing the tool’s use for analyzing someone else’s reflections, in this case, a citizen’s reflections after choosing to engage in extended dialogue with a voter from a different party [7] as part of *The Alabama – California Conversation* project curated by Spaceship Media [13].

EMPIRICAL EVALUATION

AcaWriter has been tested on reflective writing from a range of disciplines with encouraging results. The area we have focused on most is in building the professional skills of pharmacists, the particular expertise of one of the authors (Lucas). Masters level students reflect on their experiences and insights from their work placements in professional pharmacies, and writing reflectively is a formal course requirement (Fig. 2). We have demonstrated that their attitudes to such a tool shift significantly from initial skepticism to being positive after using it [12].

Reflective Report

Feedback

Resources

- Initial thoughts and feelings about a significant experience.
- The challenge of new surprising or unfamiliar ideas, problems or learning experiences.
- Deeper reflection, personally applied.
- How new knowledge can lead to a change

- Expressions indicating belief, learning, or knowledge.
- Expressions indicating self critique
- Words associated with strong feelings

- ⚡ Sentence too long, might disengage the reader. Try breaking it into smaller sentences

outcomes for the patient. ➤ Thus, this experience taught me that in future, I must take a patient-centred approach. ●●➤ I must spend time addressing the patients concerns and demonstrate excellent communication with them so they can fully understand their clinical picture and history. This relates to Domain 2: Communication and Collaboration, Standard 4: Apply Interpersonal Communication Skills to Address Problems, which is a standard in the National Competency Standards Framework for Pharmacists in Australia (2016). The incident has taught me to use a whole range of communication techniques when counselling a patient. It gave me the opportunity to practice this sort of behaviour in my subsequent weeks of clinical placement. ● It has strongly encouraged me to shift my perspective to one that focuses more on patient-centred care. ■ I personally think that this is crucial in ensuring that a patient's health objectives are met. This standard I have obtained is important for any practising pharmacist.

- Initial thoughts and feelings about a significant experience.
- The challenge of new surprising or unfamiliar ideas, problems or learning experiences.
- How new knowledge can lead to a change

Figure 2: AcaWriter provides instant visual annotation of a pharmacy student's reflective text (left), and feedback hints (right) to help the improve the draft prior to submission. Students are encouraged to redraft and get new feedback as often as they wish. Note the opening caution on the limits of machine intelligence.

Reflective Report

Feedback

Resources

Computers don't read writing like humans. So, if you're sure your writing's good, it's fine to disagree with AcaWriter's feedback, just like you'd ignore a poor grammar suggestion.

- Perhaps consider introducing your first thoughts, feelings and/or reactions to an incident, or learning task, within the first paragraph. AcaWriter couldn't spot this within first paragraph
- You have reflected on your beliefs/learning/knowledge.
- You seem to have incorporated a deeper reflection indicating self-critique.
- It appears that you have reflected in a deeper way about how your experiences connect with your professional development.
- It appears that you've reported on something you found challenging.
- It appears that you haven't commented on what you would do differently should the same event occur in the future. Perhaps think about changes in perspectives/strategies/tools/ideas/behaviour and/or approach.
- It appears that you may have expanded the detail on the challenge you faced. (1)

- Expressions indicating belief, learning, or knowledge learning, or knowledge
- Expressions indicating self critique
- Deeper reflection, personally applied

SYSTEM ARCHITECTURE AND AVAILABILITY

AcaWriter is architected in a modular way, with a clean separation between backend text analytics services (typically hosted in the cloud due to the demands of the NLP), and frontend user interface. The front and backends have been released open source [4], and a simple demonstrator version is available for small scale experimentation, enabling users to paste in small sample texts to see the automated feedback [1]. COBI workshop participants are encouraged to experiment.

Figure 3: AcaWriter analysis of a Californian Democrat woman's reflections (opening and closing paragraphs) after engaging in dialogue with Alabama Republican women [7], in the context of *The Alabama – California Conversation* project [13].

See Fig.2 for the key to the annotation icons.

Roll Tide! ● One month ago, I had no idea what that meant. One month ago, I'd never really thought about people living in Alabama. Two months ago, neither of those things mattered to me.

■⚡ **However, on the morning of November 9, as I was driving my hybrid vehicle to work, listening to the entire left-wing media have a complete melt down on NPR, I heard a polling statistic that really stuck with me: Clinton lost with college-educated white women.** College educated white women? I was stunned. Who were these women? What were they thinking? How was it possible that they voted for Trump? ■ I truly wanted to know. ■ I truly wanted to understand. I truly wanted to change their minds.

■ I joined the Alabama/California Conversation Project because I realized that I am part of the problem. ■● I had dismissed and ignored a portion of the electorate that is angry and feels that no one is listening to their problems because I didn't think *they would win*. I disengaged because I disagree. I unfriended on Facebook; I avoided difficult conversations; ● I stopped asking questions.

After participating in this group, it's not hard to figure out why this country is so partisan and divided. Because listening to each other, truly listening to different perspectives and having productive respectful dialogue, is damn hard.

When I'm responding to a question, my process is to usually yell at my computer, furiously type, stop, erase, furiously type, stop, yell, calm down and then think more deeply about my words.

■● **As difficult as this is to do, when I take the time to think more deeply about the words I write, I tend to also think more deeply about the words I hear.** And that is always worthwhile.

● Don't misunderstand, I'm not running out and voting Republican next time around, nor am I less concerned with a Trump presidency, but that was never the point. I believe what I believe and I believe that I am right, but so does everyone. So for me, moving forward means more listening, more conversations and more women in Alabama.

CONCLUSIONS AND FUTURE WORK

To conclude, in this paper we have proposed firstly, that *designing AI mirrors to provoke deeper human reflection* could be an important form of machine augmentation for human sensemaking, in the tradition of Engelbart's pioneering vision for Intelligence Augmentation (IA) [8]. Our aspiration is that such tools could make citizens more self-aware of their biases, making them less reactive, and more open to new perspectives when their assumptions are challenged.

Secondly, as an example of this approach, the AcaWriter reflective writing feedback tool shows potential for the challenges that this workshop is tackling.

All AI comes with limitations, of course, and we recognise these:

- A tool for reflection cannot make much impact if someone has absolutely no interest in engaging in reflection. However, if they are willing to engage in some introspection on their response to a situation that is challenging them, the tool can begin to coach them. Moreover, as Figure 3 illustrates, the tool could be used to analyse online texts to check whether there appears to be deeper reflection.
- The NLP and application have been developed in a higher education context, and while it has been applied to various examples of reflective writing found online (e.g. Figure 3), further testing is needed on sample texts from new contexts. We are cautiously optimistic that it will generalize, since the features of good reflection seem to be relatively robust, as distilled in our conceptual framework (Fig. 1).

ACKNOWLEDGMENTS

The research and development underpinning AcaWriter is funded by University of Technology Sydney, in collaboration with Ágnes Sándor, Naver Labs Europe.

We welcome feedback from colleagues on the potential of this approach, and this specific tool, for advancing work in this emerging field.

REFERENCES

- [1] AcaWriter Demonstrator, University of Technology Sydney. Retrieved April 3, 2020 from <http://acawriter-demo.uts.cic.edu.au> (*Select Reflective > Pharmacy > click Get Feedback to test the sample writing, or paste in your own*)
- [2] AcaWriter Orientation website. University of Technology Sydney. Retrieved April 3, 2020 from <https://uts.edu.au/acawriter>
- [3] Azarian, B. *Fear and anxiety drive conservatives' political attitudes*. Psychology Today, Dec. 2016. Retrieved April 3, 2020 from <https://www.psychologytoday.com/au/blog/mind-in-the-machine/201612/fear-and-anxiety-drive-conservatives-political-attitudes>
- [4] Buckingham Shum, S. *Open source writing analytics*. Connected Intelligence Centre, University of Technology Sydney, 2018. Retrieved April 3, 2020 from <https://cic.uts.edu.au/open-source-writing-analytics>
- [5] Buckingham Shum, S. Learning analytics & AI for future-focused learning. Invited Talk, *EduTECH 2019* (Sydney, June, 2019). Retrieved April 3, 2020 from <http://simon.buckinghamshum.net/2019/06/edutech-2019>
- [6] Buckingham Shum, S., Sándor, Á., Goldsmith, R., Bass, R. and McWilliams, M. Towards Reflective Writing Analytics: Rationale, Methodology and Preliminary Results. *Journal of Learning Analytics*, 4, 58-84 (2017) <https://doi.org/10.18608/jla.2017.41.5>
- [7] Chanduri, S. What happened when I popped my liberal bubble and talked with Alabama voters. Advance Local, Alabama Media Group. Retrieved April 3, 2020 from https://www.al.com/opinion/2017/01/what_happened_when_i_popped_my.html
- [8] Engelbart, D. C. *A Conceptual Framework for the Augmentation of Man's Intellect*. Spartan Books: WA DC, 1962. Retrieved April 3, 2020 from <https://www.dougenelbart.org/content/view/382/000/>
- [9] Gibson, A., Aitken, A., Sándor, Á., Buckingham Shum, S., Tsingos-Lucas, C. and Knight, S. Reflective writing analytics for actionable feedback. In *Proceedings of the 7th International Learning Analytics & Knowledge Conference* (Vancouver, British Columbia, Canada, 2017). ACM. <https://doi.org/10.1145/3027385.3027436>
- [10] Lanaj, K., Foulk, T. A. and Erez, A. Energizing leaders via self-reflection: A within-person field experiment. *Journal of Applied Psychology*, 104, 1 (2019), 1-18 <https://doi.org/10.1037/apl0000350>
- [11] Liu, M., Buckingham Shum, S., Mantzourani, E. and Lucas, C. Evaluating machine learning approaches to classify pharmacy students' reflective statements. In *Proceedings of the 20th International Conference on Artificial Intelligence in Education* (Chicago, June, 2019). Springer

- [12] Lucas, C., Gibson, A. and Buckingham Shum, S. Pharmacy Students' Utilization of an Online Tool for Immediate Formative Feedback on Reflective Writing Tasks. *American Journal of Pharmaceutical Education*, 83, 6 (2019), 1260-1267 10.5688/ajpe6800
- [13] Spaceship Media: The Alabama - California Conversation. Retrieved April 3, 2020 from <https://spaceshipmedia.org/projects/talking-politics/>
- [14] van Prooijen, J.-W. and Krouwel, A. P. M. Psychological Features of Extreme Political Ideologies. *Current Directions in Psychological Science*, 28, 2 (2019), 159-163 <https://doi.org/10.1177/0963721418817755>
- [15] Weick, K. *Sensemaking in Organizations*. Sage Publications, Thousand Oaks CA, 1995.