The role of asynchronous discussion forums in the development of collaborative critical thinking

Nazanin Ghodrati
The University of Melbourne

Paul Gruba
The University of Melbourne

Blended learning approaches often make use of asynchronous discussion forums (ADFs) to enhance face-to-face learning, collaboration and co-construction. One aspect of research for such online tools focuses on the development of critical thinking. But what, specifically, is the role of such technology in such efforts? Over a semester, we collected data through classroom observations, semi-structured interviews and online postings. In our cyclical thematic analyses, we identified *virtual presence*, *timing*, *display presentation*, and *skill development* as influential factors regarding the development of collaborative critical thinking. Students, nonetheless, were often very frustrated with the tool. Improvements to the actual use of the tool, combined with greater guidance, may yield stronger results.

Keywords: critical thinking, collaboration, asynchronous discussion forums, higher education

Introduction

Blended learning approaches, which combine online technologies with face-to-face learning, are now an integral part of higher education (Amhag & Jakobsson, 2009; Edwards, Watson, Nash, & Farrell, 2007; L. Lee, 2009; Sharma, 2010). Because online tools used in higher education are predominantly text-based, several researchers have focused their attention to the role of asynchronous discussion forums (ADFs) within blended learning (Suthers, Vatrapu, Medina, Joseph, & Dwyer, 2008). Increasingly, investigators consider the possible affordances that ADFs may offer in enhancing learning, collaboration and co-construction of knowledge (Haavind, 2006; Land, Choi, & Ge, 2007). ADFs are seen to provide students time for thoughtful reflection, analysis and negotiation in evolving discussions (Yang, Newby, & Bill, 2005); if designed appropriately, the fora can facilitate truly collaborative activities (Janssen, Erkens, Kirschner, & Kanselaar, 2009).

Because a major aim of higher education is to develop critical thinking, it is important to investigate the role of ADFs in the development of critical thinking within blended approaches. For Kern (2006), such a search for "transversal relationships" (p. 202) investigates the transferability of learning from one communicative context or modality to others. Rovai (2007) highlights that participating in ADFs is a kind of collaborative activity which can give rise to critical thinking. ADFs can help learners engage in continual and extended reflection by allowing them to return to the online postings any time (Lea, 2001). In turn, sustained reflection can lead to a kind of thinking necessary to make connection between old and new information, and to synthesize these. Such reflection is proposed to result in the formation of new knowledge (Kol & Schcolnik, 2008).

Over 100 years ago, Dewey (1916) suggested that successful learning is dependent on the development of communities that engage in meaningful and critical communication. Smith (1994) stated that when a group collaborates effectively, its stages of cognitive development (e.g. exploring dissonance among ideas, synthesizing opinions, testing proposed syntheses) can be recognized as demonstrations of higher level thinking. Clearly, learning develops in the light of social interactions: within a community, individuals are challenged to demonstrate their ability to question, analyze, synthesize, evaluate, and make decisions (Deloach & Greenlaw, 2005). In turn, other community members respond by suggesting justified and supported insights and criticisms that lead to solving problems and generating new ideas. We recognize that collaboration in and of itself, however, does not necessarily lead to improved critical thinking as it is necessary to have a type of social interaction that moves beyond information exchange to one which encourages a more reflective and in-depth analysis (Abrams, 2005). Further, we understand that the potentiality of online learning tools to foster collaboration and co-construction of knowledge has been yet to come to fruition (Kreijns, Kirschner, & Jochems, 2003; Reeves, Herrington, & Oliver, 2004). As pointed out by Hovorka and Rees (2009) integration of well-crafted and engaging online tasks is time consuming, and access to multiple information and learning sources may decrease learners' participation. They add that ways of structuring threaded discussions (i.e. ADFs) and multiple blogs are valuable areas for future research. What we do not yet know, however, is what role the ADF itself plays in fostering interaction and learner development.

The aim of this paper is to examine the role of ADFs in the development of critical thinking. To achieve this aim, we report on the analysis of semi-structured interviews in a blended graduate subject at a large Australian research university. Following a brief review, we set out our approach to qualitative research. Next, we detail a cyclical analysis of the data in which four themes emerge. We define each theme, provide examples and then seek to expand current theoretical perspectives. We conclude the paper with an agenda for further research.

Research approach

One initial step in research is to set a *paradigm* that is defined by Kuhn (1970) as "the entire constellation of beliefs, values and techniques, and so on shared by the members of a community" (p. 175). The researchers' paradigm (i.e. their worldviews) affects the research design, data collection, data analysis, and interpretation. In this study, we adopted a qualitative interpretivist approach. At an ontological level, interpretivists view the world as a socio-cognitive construct where multiple realities shape a unified whole rather than assuming that social reality is external to the individual. Therefore, from an interpretivist point of view, the social world is best understood by taking into account the frame of reference of individuals in action within the social world. For us, we believe that individual thought processes, including critical thinking, cannot be investigated in a social vacuum. A range of multiple factors, both external and internal, influence the development of critical thinking within real life settings; clearly, our limited study cannot begin to capture each of them. We limit our investigation to demonstrated and observable critical thinking within an academic setting.

Site of the study

The site of this study was a once-a-week-2-hour face-to-face seminar called Technology and Language Learning

(TALL) supported by an online platform (the university's Learning Management System-LMS) where students used two asynchronous online tools: 1) ADFs (whole-class online discussions triggered by the subject coordinator), and 2) wikis (for students to discuss their final projects in small groups). We only looked at participants' experience of the ADF.

Participants

Participants in the study consisted of 12 graduate students and their subject coordinator within an intact subject at a large Australian university. Each agreed to participate in semi-structured interviews, and allowed analysis of their postings. Table 1 presents demographics of participants. For the sake of anonymity, pseudonyms were used.

Instruments

Over one academic semester, we collected data through classroom observations, conducted semi-structured interviews with the student participants and observed the ADF postings. Because of a limited word count for this paper, we focus on data from semi-structured interviews.

The semi-structured interviews were intended to provide an opportunity for participants to express ideas about their experience of the ADF, to identify factors affecting collaboration and critical thinking online, and to suggest ways of improving collaborative and critical engagement in the ADF. One-to-one interviews were conducted toward the end of the semester (week 9, 10 & 11). Interviews with blended students were conducted face-to-face and audio-recorded (except for one blended participant, Trung, who asked to be interviewed via online text-chat). Interviews with fully online students, on the other hand, were conducted online via text-chat or instant messaging. At the end of the semester, we interviewed the subject coordinator about student collaboration, critical thinking development and ways to improve the efficacy of the ADF.

After some transcription, the interviews were analyzed with the help of NVivo 9.0 through several cycles until a number of supported themes emerged (see Heigham & Croker, 2009; Miles & Huberman, 1994).

Table 1: Demographics of each participant in the intact class

	Name	Gender	L1	Mode of study	Level of study	Experience with ADFs
1	Sinta	Female	Indonesian	Blended	PhD	None
2	Trung	Male	Vietnamese	Blended	MA	High
3	Kalid	Male	Arabic	Blended	MA	Medium
4	Fahimah	Female	Arabic	Blended	MA	None
5	Maznan	Male	Malay	Blended	MA	Low
6	Grace	Female	English	Online	MA	None

7	Hung	Female	Vietnamese	Blended	MA	Low
8	Danny	Male	English	Online	MA	High
9	Carl	Male	English	Blended	MA	Low
10	Nancy	Female	English	Online	MA	N/A
11	Azin	Female	Farsi	Blended	PhD	None
12	Kamran	Male	Farsi	Blended	PhD	None
13	Alex	Male	English	Blended	Coordinator	High

Factors and indicators

As a focal point in our interviews, we asked participants what factors had affected their interaction and the development of critical thinking in the ADF. Taking into account both student and subject coordinator perspectives, four broad factors related to technology, English as a Second Language (ESL), task and curriculum were identified. Table 2 provides a summary of the factors and indicators that we found affected interaction and the development of critical thinking in the online discussions.

Table 2: Factors affecting collaboration and critical thinking in ADFs

Themes	Indicators
Technology	Display presentation Virtual presence Timing
ESL	Cultural background Cross-cultural communication patterns Previous educational experience (practice vs. lack of practice of critical thinking)
Task	Online discussion questions (uncontroversial topics/ close-ended vs. open-ended) Teacher-presence (teacher feedback absent vs. teacher feedback present) Online discussion rubric (general & implicit vs. specific & explicit guidelines) Assessment criteria (general & implicit vs. specific & explicit criteria) Focus on critical thinking and collaboration in offline and online classroom (implicit vs. explicit)
Curriculum	Focus on individualistic/ competitive learning vs. collaborative learning at the departmental level Focus on vs. lack of focus on collaborative critical thinking at the departmental level

In most studies of critical thinking in online asynchronous/synchronous discussions, participants did not demonstrate collaboration (Heckman & Annabi, 2003; Leng, Dolmans, Jobsis, Muijtjens, & Vleuten, 2009; Marttunen & Laurinen, 2009; McLoughlin & Mynard, 2009; Vaughan & Garrison, 2005). These researchers, and others, have found that the possible reasons that stifle collaboration include 1) the short time allocated to online discussions; 2) unstructured instruction or guidance (lack of sufficient teaching presence); 3) a lack of motivation or goals in online discussions; 4) the type of online tasks and triggering questions posed; and 5) the learners' educational experiences and cultural backgrounds. Perhaps not surprisingly, the results of our analysis of factors confirmed a number of these findings: Participants stated items 2, 4, and 5 as among the factors inhibiting their collaborative critical thinking online. Interestingly, however, none of the participants mentioned items 1 or 3 were inhibitors.

Affordances and hindrances of ADFs

As we continued our analysis, we focused specifically on the technology-related factors to better understand the role that the tools themselves may play in learner development of critical thinking. Four themes emerged: *virtual*

presence, *timing*, *display presentation*, and *skill development*, and we expand on them below:

Virtual presence

Virtual (online) presence in ADFs in addition to the face to face presence in the classroom can serve as an affordance and/ or hindrance for interaction and/ or critical thinking.

Affordances

In interviews, participants were asked whether they enjoyed participating in the ADF. In response, many students noted that the ADF gave them an extra opportunity to share ideas with other students:

> There are many times when you might not think of something that you felt to be important while you're right there in the class but later on you have another idea and it's easy enough to just go to the discussion board at any time and let everybody else know what u think. (Carl)

> There were couple of points I could not mention in the classroom because of the shortage of time but in online discussions I could raise them and it could have bit of a discussion with our classmates. (Kamran)

Furthermore, some students mentioned that the ADF was a point of contact because, in the classroom, they would not normally talk to each other:

> I think it was important for me to almost like getting to know the other people in the class a bit better because you tend not to talk all that much with the other students in class and [the ADF] is something that lets you to certain extent get an insight into other people's ideas, other people's personalities in a way that you might not in a classroom setting. (Carl)

One reason why students thought that the ADF helped them in knowing other students better is that the TALL subject face-to-face sessions were in the form of lectures; therefore, students have little opportunity to engage in peer/ group activities.

Interestingly, many students preferred participation in the ADF as a way of avoiding face-to-face interaction:

> If you're facing this person, especially if you know that that person is more knowledgeable than you, then sometimes you feel reluctant; that it is not free for you to really open up yourself to give your own opinions towards the people, but as in the discussion board there, you don't necessarily meet with the people, right? So you can freely post your opinions there without the face threatening act. (Sinta)

Based on their responses, students' inclination for online rather than face-to-face interaction can be attributed to their personality. Anxiety, discomfort, and shyness were among reasons for preferring online interaction. These results confirm those of previous studies such as McBrien, Jones, and Cheng (2009) and Rovai (2007) which found learners' increased comfort level with Internet-based communication since anxiety of face-to-face interaction and criticism are eliminated online.

In addition, some students appreciated the fact that the ADF could be accessed and viewed only by other classmates and the subject coordinator (semi-public nature of the ADF). It was not an open forum where anyone browsing the Internet could enter and view their postings:

> I know that I personally would probably have big misgivings about putting my opinions up if [the ADF] was a completely open forum and everybody on the Internet could read it but as long as it stays within the subject I'm much more comfortable. (Carl)

Hindrances

Although most students appreciated the *virtualness* of interactions, some students mentioned lack of face-to-face contact with other students as one of the aspects of the ADF they did not like about the online discussions:

> Although [the ADF] is a wonderful tool in allowing us to feel part of the class, in reality we are not. Students don't know me, and I don't know them. I am a very chatty person:D and would readily take part in a classroom chat, because I am there to negotiate or clarify any misunderstandings. (Nancy)

Again, it would appear that personal preferences are at work. While many students preferred online interaction due to anxiety, discomfort and shyness, some preferred face-to-face interaction due to the more immediate social nature of physical co-presence. This issue is not problematic in blended learning contexts where the availability of both offline and online modality responds to different personalities and communication preferences. Unfortunately, Nancy who was a fully online student did not have the option offline (i.e. face-to-face). At another point during the interview, Nancy said that sometimes the written modality of the online discussions caused misunderstandings:

> I suppose there is also the notion of not knowing how your response is going to come across through a written post, for just as with email when the communication is not f2f [face-to-face] it leaves a lot open for interpretation. For example I had someone respond to one of my posts & I felt they were being a little negative, but I am sure in reality they were not. (Nancy)

Furthermore, the idea of posting ideas online where everyone in the class could see them made some students such as Grace, hesitant to post:

> The hesitation to post is because of the thought of] how to phrase it and then posting it for all to see, then it is open for criticism! You know the worry of ‘what if I'm wrong!’. (Grace)

Although the affordances and hindrances of ADFs regarding virtual presence are not explicitly expressed by the participants to affect their collaboration and critical thinking online, they are still important to be considered. One of the main factors to take into account when evaluating applicability and suitability of an online learning tool such as asynchronous CMC (computer-mediated communication) is its potentiality to provide a platform for generating a sense of community or social presence among online members (McBrien, et al., 2009; Rovai, 2007).

Timing

The time spent on reflecting on and structuring posting on ADFs may serve as an affordance and/ or hindrance for interaction and/ or critical thinking.

Affordances

In line with the results of most studies (e.g. Kol & Schcolnik, 2008; McBrien, et al., 2009), students in our study enjoyed the flexibility of time and space which was afforded to them by the ADF:

> I think the best thing is that you can have discussion with a group whenever you want. You don’t have to set a meeting time and everybody be present at that time, like I might post something on, I don’t know, Wednesday and somebody might join me the day after that and that's really good. I like that best. (Azin)

Most students said that they preferred the written mode of the ADF to the oral mode of the face-to-face classroom. When we asked the reason, many students said that the ADF would afford them more time to structure their posts and to reflect on them:

> When writing I am having more time, more control on the grammar and on structures and the way I’m expressing my ideas and opinions rather than speaking. (Fahimah.

> Writing' rather than 'speaking' in online discussions affects my critical thinking process and answers; I have time to draft, think, rethink, edit, read aloud, read other people's posts and make sure I'm on the right track, explore other viewpoints I hadn't considered before adding my own post, perhaps even

> change my line of thinking after considering other posts. The online mode particularly for the subject where I'm not so 'up with technology' is effective in that it allows room for the nurturing of critical thinking at the learner's own pace. If I were attending the subject in class I'm not sure I would be pushed to develop the same set of skills. (Nancy)

Hindrances

Since most students worked either part-time or full-time while studying or had workloads for other subjects, they admitted that they could not dedicate enough time to read and respond to others' posts and/ or to reflect more on their own postings:

> I'm working and also studying part-time so then it's quite difficult to find times to involve actively in the discussion board. That's the main problem actually, because at the end of the day after working hours we're very tired. Yes, I think that's the main problem. (Maznan)

> I want to give more time for the online post but I know that I have other assignments, other readings to do that makes me restrict myself to certain amount of time and just do it individually rather than collaboratively. (Fahimah)

Danny, a fully online student, was quite frustrated with the ADF due to lack of student-to-student interaction. Among the reasons he gave for why he thought there was no interaction among students (e.g. narrow questions, assessment criteria for the online postings, and lack of time due to working full-time), he mentioned that the delay in responses limited interaction among students:

> Given that we're placed all over the world, the delay in response times doesn't help [with student to student interaction. (Danny)

When there is little interaction and discussion among students, it is predictable not to find instances of co-construction of knowledge and collaborative critical thinking among students. This was in fact the case; through the content analysis of online postings we found few indicators of critical thinking in a collaborative/ dialogic fashion.[17]

Another factor expressed by one of the participants as a hindrance to online interaction was the time and effort needed to write her comments online. She felt that presenting her comments in the face-to-face classroom would be more spontaneous and interactive:

> In the ADF] you need to be more concise I think. You need to have your ideas sorted before writing. In class, you can start saying something, have a pause, someone else can add something. You can work on ideas together or at least start thinking about new ideas together. (Grace)

> [The hesitation to post is because] of the time needed to think about my view, how to phrase it. (Grace)

As evident in students' responses, time plays an important role in the quality (e.g. structure and content of postings) and the quantity of online interactions (e.g. number of postings and responses to others). Most students appreciated time affordances of the ADF. However, for some students delay in responses, the time spent on the online postings and on writing their comments became problems for collaboration and hence collaborative critical thinking.

[17] Due to space limitations, in this paper we do not report on the results of the analysis of online postings. The authors are planning to write a paper focusing on the indicators of collaborative critical thinking in ADFs.

Display presentation

Thread layout and appearance of ADFs may serve as demotivators for online discussion and interaction.

Hindrances

When we asked the students what they thought were some of the ways that the ADF could be improved, some students said that they would have been more comfortable if they had remained anonymous online:

> If there's nickname [in the ADF], we can see nickname or, for example the other students did not know that it is my response, just for example I can write Melbourne not my name Kalid. Just Melbourne or Sydney or just any nickname, I would felt more relaxed. (Kalid)

Another student found the presence of multiple threads decreasing the chance of interaction among students:

> [ADFs are] sometimes individualistic and sometimes looks like very collaborative once we get more people get involved with the one thread rather than making a new thread. (Maznan)

As it is clear in this excerpt, Maznan felt that much discussion occurred when comments were in one thread than in multiple threads. This was in fact the case; In week 9, when Alex, the subject coordinator, asked the students to stick to one thread and to respond to others' comments, students not only posted more (the average weekly postings increased from 18.33 to 26.66) but also responded more to each other's comments.

When participants were asked what factors affected their postings on the ADF, some of them such as Hung, mentioned the unengaging design of the online discussions:

> I guess that the discussion board is not very inspiring; I mean the layout or the design. It's not really friendly. (Hung)

This is an important issue to consider. Students use myriads of online software for communication and networking that in order to keep them attracted to the online tools used in higher education, IT and course designers need to adapt and use latest software that resembles the online communication tools students use outside the classroom.

Skill development

ADFs have the potential to help learners develop skills of writing, comprehension, and critical thinking.

Affordances

One of the interview questions was: What were some of the functions of the ADF for you? In response, many students mentioned that posting on the online discussion board 1) made them understand the weekly topics of the face-to-face classroom better, 2) helped them improve their writing, and 3) led them to develop their critical thinking:

1. Better understanding of topics

   > I find that [the ADF] helps me get my head around some of the concepts discussed in the readings especially when everyone has experience teaching and different experiences using technology. I think it also makes me take more notice of the reading rather than just reading them because we have to. (Grace)

2. ADF improves writing

   > Each time I post I learn something, and not to mention the language, I practice the language when writing the post [...] in the beginning I had to be careful and check everything before I post but then it turned out

to be interesting to monitor my language whenever I try to write so it makes me more careful to my writing. (Fahimah)

3. ADF Develops critical thinking

   Before I post something into the discussion board I have a question of particular issue and then from there I'll read of course. I'll read the literature and then analyse it myself and then when you come to the discussion board there you have other's opinions and then you're gaining knowledge as well from them and you start to synthesize your own opinions from the literature from the question as well with the opinions from the other members of the discussion board. (Sinta)

The last excerpt shows that Sinta would employ critical thinking skills of questioning, analyzing and synthesizing, as outlined by Gunawardena, Lowe, and Anderson (1997), before, while and after posting on the ADF.

Students' responses in this regard confirm research by Kol & Schcolnik (2008); Haavind (2006); and Land, et al. (2007), where ADFs were expressed by students to afford them time for reflection, more attention and focused analysis of the learning content.

Hindrances

Lack of familiarity with the ADF, computer skills and slow typing negatively affected some participants' expression of thoughts and critical thinking in the ADF, such as for Hung:

> I'm not very good at technology skills and computer skills and stuff. I'm not really comfortable with opening a discussion board, typing in. Sometimes I just find it kind of stopping me from thinking when I'm typing so sometimes I even have to get back to writing [on paper]. Typing takes more time so maybe when you are thinking and you are typing, the speed of typing cannot catch up with what you are thinking. (Hung)

Participants' perspectives on affordances and hindrances of the ADF indicate that apart from factors such as educational and cultural background, online task designs, and how the curriculum is designed, technology can affect the extent of interaction, collaborative discussion, and critical thinking. Table 3 below summarizes the affordances and hindrances of ADFs as emerged from the interviews.

Table 3: Affordances & hindrances of ADFs

Themes	Affordances	Hindrances
Display presentation		Non-anonymity of ADF Large number of threads Unengaging ADF layout
Virtual Presence	Extra opportunity to share ideas Way to avoid f2f interaction Point of contact with other students Semi-publicness of ADF	Lack of physical contact for online students Misunderstandings due to written mode Publicness of ADF & concern for criticism
Skills	Better understanding of topics ADF improves writing ADF Develops critical thinking	Lack of familiarity with ADF Typing
Timing	Flexibility of time and space in ADF Time to structure your post Time for reflection	Delay in responses Time to dedicate to the ADF Time & effort for writing

Theory development

Computer-meditated online learning tools in general and ADFs in particular with their potentiality to provide a platform for co-construction of knowledge are proposed to support a number of theories such as Vygotsky's (1978) socio-cultural theory, social-constructivism, and Moore's (1993) theory of transactional distance (Anderson, 2008; McBrien, et al., 2009; Moore, 1993). According to socio-cultural theory and social constructivism, cognitive development takes place first on the social level and is then internalized on the individual level (Vygotsky, 1978). Extending this notion to learning, based on these theories, learning is a social activity and learners make meaning through dialogue. According to the theory of transactional distance, three main elements in online learning contexts are dialogue, structure, and learner autonomy (Moore, 1993). The main overlapping key concept among these theories is the concept of *dialogue*. Creating dialogue in the form of learner-instructor, learner-learner, and learner-content interaction is of utmost importance in online learning contexts such as ADFs (Anderson, 2008; McBrien, et al., 2009; Rovai, 2007). However, based on previous research, it appears that dialogue in the form of learner-learner interaction is less common online, and if learner-learner interaction is happening, it is less likely to be in the form of an interaction which moves beyond the exchange of information to a more reflective and in-depth discussion (Lee & Tsai, 2011; Leng, et al., 2009; Marttunen & Laurinen, 2009; McLoughlin & Mynard, 2009). Having examined the results, we also found that learner-learner interaction, in which students would engage in co-construction of knowledge and collaborative critical discussion, did not happen in the online discussions.

As mentioned before, many online learning researchers have celebrated the potentiality of online learning tools for creating an interactive and collaborative learning context. However, according to the responses of participants in our study, we found that there are a number of factors such as those related to technology, ESL, task, and curriculum which compete with notions of social nature of learning. In our study, we highlighted the role of technology-related factors, among others. We realized that ADFs can work both as an affordance and

hindrance for collaboration and critical thinking. In this regard, for instance, Reeves, et al. (2004) highlighted the deficiency in commercial course management systems that are commonly used in higher education. Alongside other scholars, such as So and Bonk (2010) and Vonderwell (2003), they found that such systems tend to be used as replication of traditional face-to-face classrooms. They suggested that instructional designers in higher education need to see collaborative online learning tools as *a complement* to the traditional classroom rather than as a replacement to it.

Lee and Tsai (2011) have highlighted that collaboration takes place through a variety of influences. That is, for each learning context which involves collaboration, there arises a local perception and application of collaborative task or what it means to be collaborative; accordingly, different contexts give rise to different collaborative activity. In the same vein, Anderson (2008) has highlighted the drawback of prescriptive theories of online learning which try to prescribe how interaction and learning should take place. Alongside Anderson, we believe that the most appropriate theory of online learning is a descriptive one; a theory which embraces particularities and limitations of an online learning context and accommodates for them accordingly.

Conclusion

In line with other studies, we found that text-based online learning tools provide a number of affordances when integrated into the face-to-face classroom. Some of the affordances are opportunities to express and share ideas, time for reflection, better understanding of in-class topics, and developing critical thinking. Nonetheless, further research must present a more realistic account of the hindrances of ADFs, some of which were expressed by the participants in this study; such as the fact that ADF required a lot of time which students could not dedicate, did not permit anonymous postings, and that there was a delay in responses. While further research is needed to investigate the roles played by factors related to ESL, task, and curriculum in developing collaboration and critical thinking in online discussions, this paper suggests that technology be further problematized; that is, rather than a silent assistant, ADFs in and of themselves require greater attention in their role in shaping online discourse.

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Author contact details:
Nazanin Ghodrati n.ghodrati@student.unimelb.edu.au
Paul Gruba p.gruba@ unimelb.edu.au

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