

Using Academic Reading Circles in Science Education

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What are ARCs?

Academic Reading Circles (ARCs) – also known as reading circles, peer discussion groups, or literature circles – have been used to stimulate discussion and help learners construct meaning from a common text (Shelton-Strong, 2011). While ARCs have primarily been employed in K-12 English classrooms, there have been several adaptations for second language (L2) courses (Kim, 2004; McElvain, 2010; Seburn, 2015; Shelton-Strong, 2012).

Much of the formalization of ARCs is based on the work of Daniels (2002). He identified the key elements of a successful literature circle as (p 18):

- variability in temporary groups and student-chosen books
- discussions occurring regularly in an open and natural manner
- students choosing discussion topics
- use of notes or drawings by the students for guidance
- the teacher as a facilitator
- student-focused evaluations
- playful and fun atmosphere

In L2 instruction, the structure of a formal ARC consists of the mutual text, assigned student roles, and the group discussion (Seburn, 2015).

Why use ARCs in HiEd Science Education

A survey of my general chemistry students revealed similar concerning behavior, with about two-thirds of the class never purchasing or opening their textbook all term. A review of the literature reveals that I am not unique in my experience (Simpson & Nist, 2002; Lord, 2008; McCormick, 2011; Culver, 2016). Furthermore, Yonker & Cummins-Sebree have found that “a majority of traditional students are ill-equipped or unwilling to read the essential amount of text” (2009, p. 169). In their study they found that 42% of participants read less than one-quarter of the assigned material. Trusting that my students are capable of reading, but insufficiently motivated when I will cover the material in class (Klemm, 2007), I decided to invert my classroom (Lage, Platt, and Treglia, 2000; Bergmann & Sams, 2012) in a text-centric manner.

In my ‘traditional’ sections where I use a combination of lecture and active learning techniques, the majority of students never opened the textbook. They argued that my lecture notes were sufficient, and then would later argue that the exam covered content not fully address in the lecture notes (it was covered in the textbook). In contrast, more than 95% of the students in my flipped/inverted sections reported completing the assigned reading before class.

When I attempted a flipped class without academic reading circles, the students were reluctant to engage with their peers. This can be explained in term of social comparison concern (Festinger, 1954) and achievement goal theory (Dweck & Leggett, 1988; Pintrich, Conley and Kempler, 2003). Social comparison concern explains that learners assess their own qualities through comparisons to their

peers. Based on achievement goal theory, learners adopt motivational orientations that influence their learning, and the motivations can either be mastery goals (for self-improvement) or performance goals (to demonstrate abilities to a particular audience)

The use of academic reading circles has dramatically increased my students' reading habits. More details on this experiment will be reported in the upcoming ACS Symposium Book on **Technology and Assessment Strategies for Improving Student Learning in Chemistry**. My team has recently submitted a paper comparing the impact of ARCs in general and organic chemistry to the **Canadian Journal for the Scholarship of Teaching and Learning**.

For more information on how I am using Academic Reading Circles in my classrooms, please contact me at bmccollum@mtroyal.ca

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Academic Reading Circles - Group Member Roles

(Based on Academic Reading Circles by T. Seburn (2015); Adapted for Science Education by B. McCollum)

Leader:

facilitates discussion, leading toward agreement on the key points of the assigned reading

Duties:

summarizes the main ideas at the start and end of discussion, and guides the group discussion through the reading, inviting members to share what they have learned in their role

Poses questions on:

the overarching themes and ideas
concepts emerging from the reading
how group members would summarize particular key ideas from the reading

Contextualizer:

explains why the author refers to other topics, concepts, people, or dates for support

Duties:

learns about the context surrounding the reading, and determines which ideas are foci (useful) and which are tangential (insignificant)

Shares information on:

specific people, places, events, or ideas that the author mentions as support
identifies useful and insignificant contextual references

Visualizer:

Uses visuals to facilitate language used in descriptions and explains visuals that accompany the text, including graphical representations of data.

Duties:

explains visuals provided in the text, linking them to associated sentences/paragraphs
determines if provided visuals support comprehension or are primarily decorative / expand beyond the key ideas
Create visual representations of concepts in the text, such as mind maps, word clouds, graphs, charts, or disciplinary (chemistry) representations

Shares information on:

the relationship between visual representations and the text

Connector:

Creates meaningful connections between concepts in the assigned reading, equations, and related/familiar situations.

Duties:

identify connections between the assigned reading and past concepts, personal experiences, or current news/events

Shares information on:

the *relationship* between equations and the text
concepts in the assigned reading and past course concepts, or material from other courses
concepts in the assigned reading and current news/events or personal experiences

Highlighter:

Facilitates lexical comprehension, raises awareness of topical vocabulary, and explains mathematical representations.

Duties:

prepare a list of key topical vocabulary, defining each term, identifying its placement within the text, and linking it to other ideas
define the variables within equations and illustrate how to perform the necessary calculations

Shares information on:

key topical vocabulary
equations within the assigned reading

Academic Reading Circle Record

ARC Participants:

Things that we understood from the reading assignment were ...

Things that we were still confused about were ...

Concepts that we were able to resolve as a group were ...