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Working with Multiple Objectives: Using a Webquest to Teach Research Skills, Critical Thinking and Academic Writing Skills Simultaneously

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ABSTRACT

Singaporean English language education in tertiary settings is increasingly evolving due to technology use. Advances in technology are enabling lecturers to implement a diverse and complex curriculum and strive for the teaching of multiple objectives. The quality of internet sources and the ubiquity and asynchronous nature of technology can provide students with learning experiences in and outside of the classroom. This enables them to work at their own pace and focus on their own needs making the outcome more student-driven. This presentation will examine a strategy from a sample academic writing module at the Writing Unit, a satellite of the CELC, NUS, which exemplifies this. Based on the outcomes of empirical research conducted by the author, the use of webquests to teach research, critical thinking and academic writing skills simultaneously will be explored. It is hoped that this chapter will add to current practices using technology for teaching and learning in higher education and further practitioner knowledge in this realm

Keywords: Higher education; ubiquitous and asynchronous nature of technology; multi-dimensional curriculum; research skills; critical thinking skills; academic writing skills

1. Introduction

In his speech at the opening of the 7th international conference on thinking in 1997, Singaporean prime minister Goh Chok Tong http://www.moe.gov.sg/media/speeches/1997/020697.htm stated:

"Education and training are central to how nations will fare in the future. Strong nations and strong communities will distinguish themselves form the rest by how well their people learn and adapt to change. The task of education must therefore be to provide the young with the core knowledge and core skills, and the habits of learning, that enable them to learn continuously throughout their lives. We have to equip them for a future that we cannot really predict."

These same skills are still at the heart of Singapore's educational practices and as noted by Goh Chok Tong, should be required throughout one's life. This researcher will be exploring a multidisciplinary, academic tertiary setting as a medium through which to provide certain core knowledge, core skills, and habits of learning that are useful throughout a person's life.

Due to the availability and quality of online resources today as well as the ubiquity and asynchronous nature of technology, lecturers are able to provide learning experiences in and outside of the classroom. This enables them to implement a diverse and complex curriculum and strive for the teaching of multiple objectives. Lecturers are also able to provide learners with more opportunity to review classroom input or teacher-student interactions in their own time. This paper will present a strategy from two sample modules at the Writing Unit, a satellite of the CELC, at NUS. It portrays the use of a webquest to teach research skills, critical thinking and academic writing skills simultaneously. It is believed that the webquest equips learners with core knowledge, core skills, and habits of learning. It is also hoped that this research will add to and further practitioner knowledge in the realm of using technology for teaching and learning in higher education.

2. Theoretical Underpinnings

Core knowledge

Direct instruction through which language is dissected into small discrete items and skills is deemed limiting in its nature. Instead, what is essential is how an agent interacts with that knowledge: a process which involves differing cognitive applications of the knowledge through engagement in activities that apply critical thinking. The underpinnings of this theory originate in cognitive science and the way humans think. As Teine (2000) points out, learning is not a passive process of transmitting, storing and retrieving knowledge. Rather, knowledge needs to be processed through conscious organization or elaboration. If not, it can readily be forgotten (Roblyer, 2000). Bloom's (1956) ascending levels of thinking examines these processes. It ranges from the simplest level: *knowledge* or the reproduction of what one has learned; through to *synthesis*, or the ability to create new knowledge based on what has learned and synthesized. However, this paper is using the model from Anderson *et al* (2001) for its 'core knowledge'. These authors have adjusted Bloom's (1956) model and their work has been applied extensively in education. This provides the basis for the core knowledge at tertiary level targeted for the webquest.

In Anderson *et al's* (2001) revised taxonomy, the original *knowledg*e category is changed to *remember.* This refers to the shallow processing of recall and recognition. Action verbs that demonstrate student knowledge include *describe, define and identify.* Thus, at the *remember* stage, the learner is accommodating the knowledge. The second category is *comprehension* in Bloom's (1956) taxonomy and has been refined as *understand*. Students are asked to *infer* or to *judge* at this level. The third category, *application* is adjusted as *apply* in the revised taxonomy. Students are required to *explain, solve* or to *transfer* knowledge or skills to unfamiliar situations answering constructions such as: *predict what would happen if . . .* and *judge the effects of . . . Analysing* in the revised version requires students to break down knowledge into parts and draw conclusions from this. Students are asked to reply to questions such as *what function does . . . have?* And *what conclusions can be drawn from . . .?* Thus, as the knowledge becomes more and more situated in more complex cognitive processes represented by the levels of thinking, it becomes more assimilated. In Bloom's (1956) taxonomy, *evaluation* is the highest cognitive; however, Anderson *et al* (2001) hold the premise that *creating* new knowledge should be perceived as more complex than *evaluation*. *Evaluation* asks students to reply to the following genre of questioning: *do you agree that . . .? How would you prove or rate this? Create*, on the other hand, which originally relates to Bloom's (1956) *synthesis,* requires students to connect new and prior knowledge from multiple texts and from that create a new text. *Creating* thus requires students to *find another way to use knowledge* or *hypothesize an outcome if ...* With regard to Anderson *et al*'s (2001) taxonomy, tasks that require students to *analyze, evaluate* and *create* are those that help to assimilate the new knowledge the most.

Core skills

At tertiary level, students are learning to develop research skills. These are deemed as paramount to the success of their education. Further, research skills are essential in most professions. The University of Adelaide has created a useful Research Skill Development Framework http://www.adelaide.edu.au/rsd/framework/. It is a conceptual model which presents the spiraling development of a student's research skills. On the Y-axis is the *face of research* and this comprises action verbs that represent a process of increasing rigour as students delve into a line of inquiry. Students move from *curious* to *determined*, to *discerning,* to *harmonising, to creative* and finally *constructive.* At the constructive end of the continuum, students *communicate and apply*; in other words, they *write, present and perform the processes, understandings and applications of the research, and respond to feedback, accounting for ethical, social and cultural issues.* On the X-axis, sits the *extent of the student's autonomy*. For this, there are 5 levels moving from *prescribed* to *bounded*, to *scaffolded*, to *student-initiated* and finally to *open research*. Asking first or second year tertiary students to conduct academic research and write a paper on a field of interest to them, they are developing their research autonomy, and after scaffolding, when capable of conducting *open research*, they have generally developed some excellent *core skills.* Such skills are outlined in the Research Skill Development Framework as the ability *to collect and record self-determined information from self-selected sources; organise information using self-determined structures*; and to *analyse and create information to fill self-identified gaps.*

Banchi and Bell (2008) posit that inquiry teaching and learning comprises a four-tiered progression. This provides a guide for scaffolding inquiry learning skills and is linked to the Research Skill Development Framework from the University of Adelaide. The first stage is *Confirmation Inquiry*, which involves the teacher demonstrating to students how results, already presented to them, were attained. Students learn how to follow procedures and record data. *Structured Inquiry* requires students to conduct research by following a procedure given. *Guided Inquiry* involves students following their own procedures to answer a given question. Finally, *Open/True Inquiry* requires students to find their own question and follow their own procedures in order to communicate an outcome. This final stage is therefore similar to level 5 on the Research Skill Development Framework from the University of Adelaide. Banchi and Bell (2008) explain that this final level is rarely successful if students are not motivated by intrinsic interests or the research skills to conduct their own study. In the same way, educators often use Bloom's (1956) Taxonomy in inquiry-based lesson planning using a linear approach to achieving learning objectives. That is, they will focus on activities that scaffold critical thinking: first these might require students to understand the content of a lesson; and then progressively help them to build connections between the new and their old knowledge. They then tend to focus on building students capabilities to apply the knowledge in a structured, and then, ultimately, in an independent way. Thus, the core knowledge and the core research skills are built progressively.

Habits of Learning

The value of another person's perspective, usually gained through interaction, is a key learning component in social constructivist theories (Cochran-Smith and Lytle, 1993). Distributed cognition (Vrasidas *et al*, 2003b) is a term that is used to describe how new knowledge commonly emerges through interaction. The process of sharing individual perspectives is known as 'collaborative elaboration' (Van Meter & Stevens, 2000), and this leads to learners constructing understanding together which is said to be beyond the understanding that an individual alone would have constructed (Greeno *et al*., 1996; Ritchhart, Church, & Morrison, 2011). Thus, constructivists promulgate that teams are able to operate at higher levels of thought due to these processes of sharing knowledge and expertise. Groups are also said to be able to remember information for longer periods than individual students (Johnson *et al* 1990) as discussions result in change as 'an ongoing, collective responsibility' (Opfer & Pedder, 2011: 385). Knowledge can thus be seen as socially and culturally constructed (Prawat and Floden, 1994). Being able to work in a team is an essential characteristic of success in workplace structures. As Henry Ford (http://www.forbes.com/sites/erikaandersen/2013/05/31/21-quotes-from-henry-ford-on-business-leadership-and-life/) stated 'coming together is a beginning, staying together is progress, and working together is success.'

3. The Study

Motivation for the study

The study arose through necessity. Through the reading of first year students' writings, it was observed that constructing logical, persuasive arguments was somewhat problematic and, in addition, using counter-claims and rebuttals in papers, rare. An example of an illogical line of reasoning from a student's work is provided below:

It is obvious to anyone thinking logically that *athletes should represent positive social values. If they take performance enhancing drugs (PEDs), they are not. In addition, as stated by the President's council on bioethics, no biological agent powerful enough to induce major bodily alterations can be entirely trustworthy or without side effects.*

In this extract, the writer does not fully expand on the argumentation of the topic sentence, which is the representation of positive social values. It would be preferred if these were delineated, for example, a social value might be *striving for distinction naturally through dedication.* Further, the premise that PEDs are dangerous is a shift in topic is, and this appears without transition. If these lines of reasoning are to be used, a different controlling idea (topic sentence) is required. An appropriate opening instead might be:

The argument against athletes using PEDs can be considered on both macro and micro levels.

This opening could be followed in the following way which would be an acceptable line of argumentation:

On a macro level, an athlete should represent positive social values, for example, he should be seen to be striving for distinction naturally through dedication, and not excelling through cheating. This could have negative consequences for adolescents who can be greatly influenced by their heroes. On a micro level, it has been argued, based on research (Savulescu, 2005), that athletes can dope without health problems arising. However, these studies are outweighed by evidence demonstrating that the use of PEDs can be irremediable. As the President's council on bioethics states, no biological agent powerful enough to induce major bodily alterations can be entirely trustworthy or without side effects.

As demonstrated from the initial extract, the logic is not clear because there are two lines of reasoning in the paragraph and the second is not part of the controlling idea opening the paragraph. In addition, the argumentation in this first extract is not elaborated appropriately: a simple, 'they are not' is evidently not persuasive. In contrast, elaboration, using an example of a social value, as read in the second extract, aids this line of reasoning. Also, the topic sentence in the second extract allows for differing lines of reasoning because it introduces these effectively. Finally, in the second extract, a consequence of not representing positive social values is provided. Using the Toulmin Method, which is described below as it is the core learning outcome of the webquests developed, this consequence might be construed as a *warrant* or an underlying assumption that connects a claim and the evidence offered). The evidence in this case is the type of social value discussed.

Webquest structure

Webquests that the author has developed to facilitate the progressive learning of these skills, analyze well-known academic writing sites such as the Writing Centre of the University of North Carolina and Purdue University's *Online Writing Lab*. These sites have been set up to raise students' awareness about important characteristics of good academic persuasive writing. The common schema of the genre is provided below:

- Introduction: orients students and captures their interests by presenting the theme of the webquest. This typically involves providing background information and introduces students to key vocabulary and concepts required to complete the task(s).
- Task(s): presents clearly and precisely what the learners have to do and provides a description of the activity's end product.
- Process: explains how students complete the task(s) using a pre-defined set of resources.
- Evaluation: measures the results of the activity and encourages students to reflect on its process and results.

This research follows this structure but the introductory stages are quite extensive and are split up with other non-web-based tasks in order to build the context for the core main task, which is learners developing their own example of a Toulmin Method skeleton text, presenting an evidence-based argument logically and effectively.

Webquest description and rationale

Several small-scale quests and two main quests will be described. The smaller tasks are really just preliminary tasks used as the introduction to orient learners to the theme of developing effective arguments. These can be conducted in one class as a build-up to the final core task. They might be described as mini quests that range from open structure, in that no websites are provided for the search, to structured, whereby students are directed to precise online sources to find specific information. The main research tasks involve finding out about how to develop an effective argument using the *Writing Centre* of the University of North Carolina (http://writingcenter.unc.edu/handouts/) and the *writesite* at Sydney University. The final task is also a significant one, for which students are required to research a topic and construct their own skeleton text using the Toulmin Model to present an effective line of reasoning regarding the use of PEDs in sport.

As an introductory open task, I ask students to research logos (appeals to logic), pathos (appeals to emotion) and ethos (appeals to status/ credibility of the author) as means of persuasive appeal. They then discuss which is most common in debate and argumentative expository writing. Logos and ethos are often

most persuasive but appeals to emotion (pathos) are also present in rhetorically-intensive papers. An argument that might use these appeals is provided below:

Pathos & ethos	*No biological agent powerful enough to induce major bodily alterations can be entirely trustworthy or without side effects*
Ethos	*Performance enhancing drugs (PEDs) induce major physiological change*
Logos	*Therefore PEDs y should not be legalized*

Students are then asked to contemplate what organizational structure aids in the development of an argument for a paper of this genre. At this stage, terms such as claim, evidence and rebuttal are elicited. However, *syllogism* (which is the structure above) or *enthymeme* (an informal syllogism) rarely surface – these concepts tend not to be taught at school or junior college. In order to find out about these, students are given another minor task by directing them to Purdue University's *Online Writing Lab* (https://owl.english.purdue.edu/owl/resource/659/02/) where examples of syllogisms and enthymemes are offered. One of the most famous of syllogisms was made by Aristotle:

All humans are mortal. (Major premise - assumed)
Socrates is human. (Minor premise - stated)
Therefore, Socrates is mortal. (Conclusion - stated)

The enthymeme or informal syllogism of this is *Socrates is mortal because he's human.*

After this brief task, students are asked to do a more significant quest to find out how logical argumentation is constructed using the Toulmin Method or TM (also found at Purdue University's Online Writing Lab (https://owl.english.purdue.edu/owl/resource/588/03/). This model is akin to the logical syllogism as it works with premises and conclusions in this way. For example, below is a *warrant*, similar to the structure of the enthymeme above, based on major and minor premises:

Warrant: Switching to hybrid cars should have an impact on fighting pollution (major premise) because cars are the largest source of privately produced air pollution (minor premise).

Students read examples of deconstructions of essays using the Toulmin Method on the Purdue website and notice that it also often incorporates a counterclaim and challenges that counterclaim with evidence – this helps to build an argument's persuasion. Once these concepts have been explored, students are provided with a task. They are asked to apply the TM framework to an argumentative text from a previous student on a similar course (1500 words) or a rhetorically-intensive text from an academic journal (3000-5000 words), which can be relatively easily broken down. One example academic journal paper is by Spriggs *et al* (2005) entitled Hypoxic air machines: performance enhancement through effective training or cheating? from the *Journal of Medical Ethics.* In groups, students are asked to identify the claim (the writers' thesis), the data (the evidence to support the claim), the warrant (the underlying assumption that connects the claim and the data), any backing (reasoning that may be needed to provide support to the warrant), and the counterclaim and rebuttal (if there are any). An example of a deconstruction of the Spriggs *et al* (2005) paper is provided below:

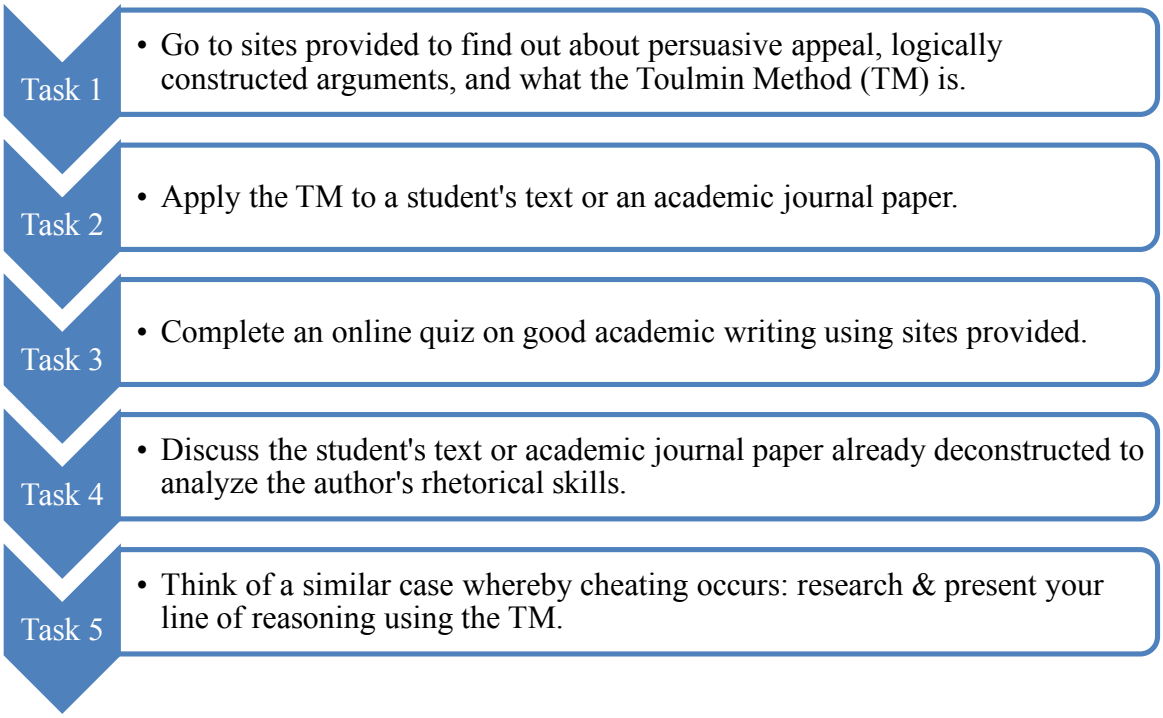
Claim: Hypoxic air machines are used to train athletes to perform at high altitude.
Data 1: Many athletes who normally train at low altitude and who need to compete at high altitude use them.
Warrant 1: Use of hypoxic air machines makes it fairer for these athletes to train to compete in high altitude.
Data 2: From a qualitative interview with several coaches and athletes, it was made clear that the use of hypoxic air machines is not the same as using performance enhancing drugs nor is it cheating.
Warrant 2: Using performance enhancing drugs is cheating.

Counterclaim: Based on interviews with other athletes and coaches, it appears that some believe training with hypoxic air machines to be cheating. This is because it is an artificial method of training.
Rebuttal: It is unfair that some athletes have the opportunity or can afford to train at high altitude before a competition is held at high altitude. Why shouldn't athletes who do not have 'natural' access make use of technology in this way to make the build up to a competition fairer?

In order to perform the deconstruction of this text in this way, students need to collaboratively use thinking skills such as *describe, define, identify, understand*, *infer*, *judge* and *apply*, all at levels 1, 2 and 3 on Anderson *et al*'s (2001) taxonomy. They must prove that they understand the meanings of the different elements of the Toulmin model; they then need to apply the meanings in the text to these through inference and judgement and pinpoint the main premises of the messages portrayed. In addition, because these tasks are conducted collaboratively in groups, higher levels of thought due to processes of sharing knowledge and expertise can be facilitated. In this way, through these good habits of learning, it is hoped that the Toulmin Model can be assimilated effectively.

After this core task, students are asked to collaboratively complete a core webquest focusing on what makes for good academic persuasive writing found on sites provided by the *Writing Centre* of the University of North Carolina (http://writingcenter.unc.edu/handouts/), the *writesite* at Sydney University (http://writesite.elearn.usyd.edu.au/) and Owl at Purdue (https://owl.english.purdue.edu/owl/resource/659/02/). This task is a structured quiz consisting of information-finding and text analysis questions. The reason why this is guided is because there is a lot of information to peruse, which can be time consuming. Added to what has already been achieved through the mini quests and TM analysis task, this quiz ensures that students are equipped with the fundamentals regarding how good academic writers present a purpose or position precisely and completely; how they build relevant, logical, and fair arguments using the Toulmin Method; how they express ideas clearly; cite relevant evidence to support a position; and accurately grasp the point of view of another author or speaker and incorporate this effectively in a paper. Students are therefore asked to find information quickly from these websites, an important research skill, and, once the quiz has been completed, and students have provided feedback on their answers, they are asked to apply higher order thinking skills (as relayed by Anderson *et al*, 2001) and to return to the deconstructed paper (e.g., on hypoxic air machines). Using the information that they have just searched for, students are asked to evaluate the author's argumentation by answering questions such as *do you agree with the author? Why? Do you think the argumentation is sound? What do you think of the evidence cited?* They are given time to prepare to justify their opinion.

As a final core task, groups are asked to consider other areas where cheating occurs in sport, in particular (but not solely if they wish to cover another issue such as max fixing), by using illegal substances such as anabolic steroids. From this, they research sources (these are sometimes provided but not always depending on whether the students are able to find reliable sources) and they design a plan for a paper. They are guided to construct this plan using the Toulmin Model as a means of organization i.e., claim, data, warrant, counter-claim and rebuttal. These paper skeletons are then presented and discussed in class. In this way, students have *created,* as Anderson *et al*, (2001) advocate, by connecting new and prior knowledge from multiple texts to write a new rhetorically-intensive text. This process is presented below in flow chart form in figure 1.



As is presented at the beginning of this section, a process explaining how students complete the task using a pre-defined set of resources is often provided. For this task, the author provides a reliable source on the PED debate such as drugsinsport.com, debate.org or sportsanddrugs.procon.org/. These sites offer a variety of views on this issue from both sides as well as plenty of evidence from credible sources.

Regarding evaluation, a rubric assessing the students' ability to present a position precisely and completely; to build relevant, logical, and fair arguments and to cite relevant evidence to support a position is used. It is also possible for this rubric to be applied as part of a peer review process, which helps students to acquire its conceptual content effectively. By applying the criteria to another's work, groups implicitly consider their own work in relation to their analyses of others. In addition, another group can be pinpoint weak points not noticed by a group, which can help in constructing a stronger line of reasoning and argumentation.

Often, presenting their case using the Toulmin Method, is the final task in this suite for students. However, if there is time and it is considered worthwhile, the presentation can be further extended. Students can be asked to collaboratively draft a rhetorically-intensive paper. With second year students, this can also be developed into a typical academic research paper comprising *Introduction*, *Literature review*, *Methodology, Results and discussion*. In other words, learners can be asked to construct a research design and to carry out empirical research. The data collected can be used to develop evidence-based arguments in the same way as the rhetorically-intensive papers use exemplification or other sources to construct arguments.

4. Discussion And Conclusion

These activities were conducted with two classes: one first year class who were tasked to write a 1500-word expository paper on a debatable topic; and a second year class required to write a 3000-word research paper. The author conducted qualitative analyses of the students' papers and found that their argumentation was indeed logically and precisely constructed using the Toulmin Method as a scaffold. It was also found that evidence was applied systematically and convincingly. In addition, the author conducted end-of-course questionnaires to ascertain the students' attitudes to the webquests. The classes comprised twelve students each. All students responded anonymously through *surveymonkey* to increase the reliability of the responses. Both classes unequivocally found the use of the websites very effective. From informal follow-up qualitative feedback from students, the author found out that students felt more confident in their writing and more autonomous knowing that these writing websites are available for independent study. They also found

the Toulmin Method to be an effective way of deconstructing a paper as well as scaffolding the building of an argument.

The term webquest seems perhaps outdated today as it emerged when using the internet for educational purposes was still relatively new. Today, it is ubiquitously integrated into academic courses at tertiary level. However, with the number of sites available, and their varying degrees of quality, it is perhaps still wise for the educator to pinpoint sites that can be exploited for research and learning. In addition, it is advisable that the educator scaffold the use of some of these sites by setting up mini introductory tasks within limited time frames. Evidently, it is also of paramount importance to facilitate more open research-based tasks that students may conduct independently. It is hoped that this study might be reenacted or extended by likeminded educators who strive to develop *core knowledge, core skills,* and *habits of learning* as they have been presented in this paper. The suite of collaborative activities described culminate in the ultimate level of core knowledge pertaining to Bloom's (1956) and Anderson *et al's* taxonomies, which is *creating* or *finding another way to use the knowledge learned.* Cheating in sport was used as a topic through which the skill of argumentation could be learned. This skill was then transferred (*using the knowledge learned)* to students' own writing. In order for students to do this, they had to collaboratively research more or less independently to find their own question following their own procedures. This is the basis of *Open/True Inquiry*, as stated by Banchi and Bell (2008) and core skills outlined in the Research Skill Development Framework. In addition, the outcomes of these skills were seen as products of 'ongoing, collective responsibility' (Opfer & Pedder, 2011: 385), a result of distributed cognition, and an example of a good habit of learning.

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