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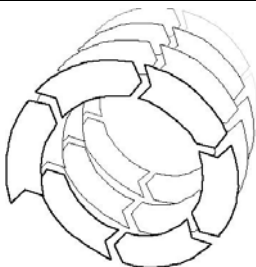
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Editorial

Among the challenges facing educators of all persuasions (teachers, lecturers, trainers and so on) are the issues of gaining and maintaining student or participant attention, ensuring both the transfer of knowledge and use of that knowledge beyond the immediate situation, and assessing or measuring the learning. The days of undivided attention by students and participants are long gone. The breadth of stimuli to distract the student is endless and the desire for short-term learning outcomes are just two reasons educators constantly seek to improve the transfer of knowledge.

The articles in this issue of the ALARj explore several circumstances in that search for improvements in education using action research: composition writing (Wong), scientific explanations for experimental based questions (Goh and Shireen), environmental citizenship (Avriel-Avni), assessment (Cameron), and academic cabaret (Hill).

Christina Wong Hsui Peng considers the challenge of English composition writing that most students do not like, and which is one of the most difficult to teach. Her personal experience showed her that most students do not write intuitively, with poor idea generation and lack of logical ordering leading to missing links in the story plot. She embarked on an action research project to find an instructional approach that engaged with students, and stimulated their thinking, so that they created stories with richer and more coherent content. Her approach included the adoption of the "Oral Discourse Approach," described by Golub (1970) and Wyans (2008), incorporating the use of a "Plot Graph", with the underlying use of the Dialectic Soft Systems Methodology described by Dick (2002) and Tay and Lim (2007). Her results indicate "that the oral discourse approach is a worthwhile venture for fellow teachers to try out in the teaching of English composition writing in their classrooms". (This Publication)

Deborah Goh Hui Hui and Zulaiha Shireen Bte Mohd Salleh have described their journey in devising a method to improve students' ability to develop scientific explanations for experimental based questions. Where Wong found that students had gaps in logic while writing English stories, Goh and Shireen found that students could not describe the data presented to them or link scientific concepts to the data. Their solution, identified during a participative action research project, was a collective use of several components. They found:

... three factors that must converge to impact the development of a student's ability to construct scientific explanations and consequently, better understanding of scientific concepts. They are as follows:

1. DINE action strategy (Logic)
2. Domain knowledge through bite-size classroom teaching (Epistemology)
3. Focal lessons within ZPD (Ontology). (This Publication)

Wong and Goh and Shireen concentrated on the outcomes to their students. Noa Avriel-Avni, on the other hand, faced the dilemma of seeking to inspire her students to be environmental citizens, without forcing her environmental activism on them. She adopted an action research approach as her students undertook environmental activities. She incorporated reflection by the students during the program, both of themselves and from their experience and the learning from their peers. She found that the students' experience "liberated them from a sense of oppressive shackles and allowed them to acquire a sense of control as well as an ability to engender change."

Reflections also indicate that students' exposure to the notion of 'ecological thinking' and the experience of 'environmental citizenship' through 'action research' allowed students to construct a bridge between academic culture focused on theory and the activist culture that tends toward practice. (This Publication)

Leone Cameron reports on a third project arising from a specific action research study to improve teaching skills and the student experience, in response to a desire to change assessment tasks. The project introduced students to Participative Action Learning Action Research (PALAR) and assigned them to cross-cultural research teams, so that they could individually answer questions put to them through a mock radio interview. Students were encouraged to use the Revans (1980) action learning equation, $L=P+Q$, as the basis of developing deeper knowledge. The qualitative results of this project were encouraging, with students finding the PALAR team discussions very useful, while the radio interview provided an innovative way of increasing engagement and encouraging creativity. Cameron asserts that replacing the multiple-choice questionnaire test with mock radio interview as a form of assessment gave students the opportunity to express their creativity and engage in deeper learning:

The students demonstrated increased engagement through their ability to shift their learning to a deeper level at which shared opinions promoted greater understanding – a feature missing from the previous MCQ [multiple-choice questionnaires] assessment. (This Publication)

In each of these research projects, the students were involved in the action research. Both the students and the author found learnings through the PALAR approach.

In our final article, Geof Hill explores his journey to develop both a better way to encourage knowledge exchange and the research inherent in developing this improved method. He describes the action learning process he undertook to develop his “academic cabaret”, following a process to document the development:

One’s experience of a practice is thus reconstructed through marshalling incidents and or literature into a frame for understanding the practice. Even though the evolution of the actual experience may not have appeared systematic, making possible connections explicit through documenting this provenance allows an inquirer to posit a possible and plausible developmental framework. In this sense, it has the effect of a reverse action inquiry. (This Publication)

His inquiry is a specific example to highlight the research dimensions associated with the development of a presentation in the form of a cabaret performance.

We invite you to dive into this issue of the *ALARj*. Please enjoy the recount of the authors' action learning journey, while they undertake or lead action research to improve their particular area of educational practice.

The Editorial team thanks the tireless voluntary contributions of our international review panel making the double blind peer review standards of *ALARj* available to our authors and readers.

Finally, the ALARA Management Committee thanks Susan Goff, who has been Managing Editor of the *ALAR* Journal since 2010, often editing as well as co-ordinating it. Susan has moved on to her next projects and we are in awe of her tremendous work. Thank you, Susan, and good luck with those new projects.

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Colin Bradley and Susan Goff

Using Action Research to implement an oral discourse approach for teaching composition writing¹

Christina Wong Hsui Peng

Abstract

English Composition writing requires thinking as one writes and it demands that a pupil uses written sentences to connect ideas to present a composition story in a coherent manner. Yet, English composition writing remains a challenge for many pupils and they do not enjoy it. This research responds to this challenge by doing three things. First, it gets to the core of what a composition writing lesson should be like, by adopting an "Oral Discourse Approach" as described by Golub (1970) and Wyans (2008), to help pupils generate ideas and supply reasons to ensure that each idea flows logically. The compilation of written ideas would then enable pupils to construct their individual composition in a coherent manner. Second, it expands the work of Golub (1970) and Wyans (2008) by incorporating the use of a "Plot Graph" to help pupils order and organize their ideas. The application of "arrows and numbered boxes" in a Plot Graph helps pupils visualize how the flow of ideas forms a sequence of events leading to the climax and how it resolves, thereby showing how a composition story is developed in a step-by-step manner from start to end. Third, it uses the Dialectic Soft Systems Methodology described by Dick (2002) and Tay and Lim (2007) to explain how

¹ A similar version of this paper was published in the Proceedings of the 58th Annual Meeting of the International Society for the Systems Sciences (<http://journals.iss.org/index.php/proceedings58th/article/view/2211>). The double-blind review associated with the preparation of this version has produced the rewriting of several sections

the process of composition writing can be described as progressing through four dialectics. The experience of the instructional approach described in this paper may be adapted by fellow teachers for composition writing in other languages.

Keywords

Composition writing; instructional approach; oral discourse; coherent story

With the exception of a small minority, composition writing remains a challenge for many pupils and they do not enjoy it. Besides, from the teachers' perspective, many colleagues of mine would agree that the teaching of composition writing is one of the most difficult components in the English curriculum. It is difficult to bring about a significant improvement in pupils' composition scores even after spending much time teaching and correcting pupils' written scripts.

A typical composition writing lesson that is taught in my school will involve the teacher spending no more than two thirty-minute periods to discuss with the class on how a set of four pictures (the "stimulus") are connected to form a narrative story. Thereafter, the inherent assumption is that pupils would be able to elaborate on the plot and write their composition stories independently. This current way of teaching English composition writing seems to be an apparently ineffectual practice.

However, drawing from my personal classroom experience, teachers cannot expect pupils to write intuitively. I have observed that only a small handful of pupils in my class were able to write a good composition containing well-developed ideas, whilst the majority of my pupils' composition stories were usually under-developed. The persistent weakness seen in my pupils' composition stories was in their idea generation and in their elaborations to construct the content. There was also a lack of logical ordering in their written sentences, which often led to missing links (or 'gaps') and confusion in their story plot.

Triggered by this concern in my school, I embarked on this Action Research ("AR") journey. As I proceeded in my AR, I adjusted my teaching approach by taking into account my growing understanding of an oral discourse approach to teach composition writing.

Formulating my Research Question

The challenge faced by teachers in teaching composition writing could be due to the fact that writing is a complex process and that pupils lacked the ability in coming up with a good flow of ideas to develop their composition plot in a coherent manner from beginning to ending. Many pupils began their composition writing straight away with little thought of how their ideas should flow to build a coherent story. In fact, there is also a group of pupils who may not even have any idea as to how should they go about composing their story.

In a paper written by Parke (1959), she stated that "Composition writing is essentially a thinking process" (p. 110). This indicates that composition writing requires thinking as one writes, meaning that the writer's thoughts are visualised by the written words. Therefore, it demands that the writer uses written sentences to connect ideas to construct his story in a coherent manner. As such, the writer must have a strong sense of logic in seeing what is missing in his plot development.

Unfortunately, in many of my pupils' composition stories, I observed that the context, leading from the rising action to the problem and subsequently to the climax was weak and it was often written in too few sentences. Likewise, the resolution to the problem was also written too simply. For example, in a composition story on a fire, I can expect half the pupils in my class to write the resolution in a simplified manner, such as; "*... the fire engine arrived and the firemen put out the fire...*" However, pupils should in fact break it down into several steps, explaining who rang for the fire engine and how the firemen went about putting out the fire. A well written resolution requires many more

sentences to provide the reader with a clearer picture on how the problem was resolved in incremental steps.

In wanting to respond to my pupils' weaknesses in their composition writing, I became motivated to investigate if there was any particular instructional approach that I could use to teach composition writing, which would be effective in improving the quality of the written composition stories of my pupils. In the light of this motivation, I formulated my research topic as follows:

"To seek out an instructional approach that can engage the whole class during teaching and can stimulate pupils' thinking to construct a composition story with a richer content and written in a coherent manner."

Literature Review

In one of the largest systematic reviews published by Andrews et. al. (2005/06), to find out the effects of grammar teaching (such as, text and sentence-level grammar teaching) on the accuracy and quality of 5 to 16 year-olds' written composition, it was concluded that "there is no high quality evidence that the teaching of grammar, whether traditional or generative/transformational, is worth the time if the aim is the improvement of the quality and/or accuracy of written composition" (p. 6).

In a subsequent research conducted by Andrews et. al. (2005/07), it was found that the teaching of sentence combining, which meant embedding one sentence or idea into another sentence to create sentences that were more varied and interesting, was effective in developing writing skills. It was clearly concluded "that sentence combining is an effective means of improving syntactic maturity of students in English between the ages of 5 and 16" (p. 2).

In a journal publication by Golub (1970) to test the effect of oral discourse in teaching written discourse, he found that the use of oral discourse "produced more grade increases and fewer decreases in written discourse." He stated that "the process of teaching composition must capitalize on the influence which oral

discourse has over written discourse” (p. 115). His proposed model for teaching composition is shown in Figure 1.

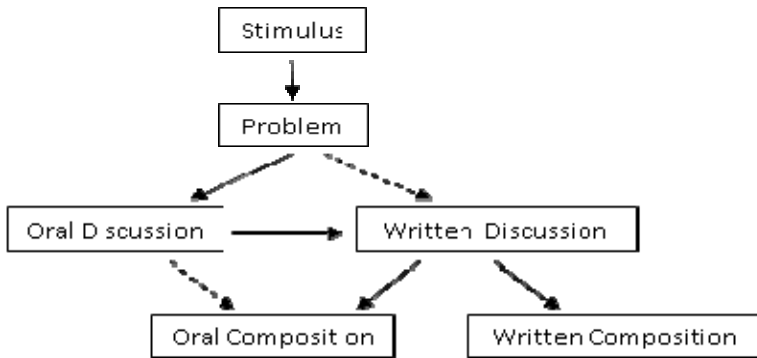


Figure 1: Oral discourse approach proposed by Lester S. Golub (1970)

And in a later study also conducted by Golub (1971), he explained that the difficulty encountered by many writers in their writing was at the rhetorical level rather than at the grammatical level. He suggested that teachers can help pupils write better by helping them to order their thoughts, thus attending to their rhetorical thought problems (p. 34).

Wyans (2008) also wrote about teaching composition writing using “*The Oral Discourse Based Method*”. His method of teaching composition writing followed a schematic involving four major box flows, namely:

1. The Stimulus
2. The Problem
3. Oral Discussion
4. Written Discussion

In the context of this AR, the stimulus refers to the given set of pictures about which pupils were required to write a narrative composition. During the problem stage, Wyans (2008, para. 11) pointed out that “teachers should give guiding questions which

are sequenced in such a way that the answer will produce an organized paragraph.” During the Oral Discussion stage, Wyans suggested that “discussion may occur as a class dialoguing with the teacher or by small group which discuss within themselves the stimulus and the problem presented by the teacher” (para. 14). Wyans stated that “the written discussion stage is the step where the initial flow of ideas might occur that would result to the first draft of the composition, an outline, or simply some random notes or ideas on the subject. It is also a deliberate list which provides for the student’s initial attempt to write” and it is “at this part of the model, the teacher and the pupils become concerned with the mechanics of writing and the organization of ideas and the content of the composition” (para. 15). Finally, Wyans explained that “this method of teaching composition would also force the teachers to look at the study of language as both an oral and a written activity as composition writing would follow a discussion first, write later approach” (para. 17). However, he pointed out that this approach of teaching English writing required a lot of time and close supervision from the teacher to make sure that the discussions were on track.

With my growing understanding of an oral discourse approach for teaching composition writing, I was optimistic that this approach could benefit my pupils. I felt that by using carefully planned questions and through open discussion with my pupils and between pupils themselves, it would help my pupils to delve deeper into their rhetorical thought processes.

My Intervention in Class

Based on my pupils' writing performance for a graded piece of composition that was done at the beginning of Term 1 in year 2013, I noted that about two-thirds of my pupils' composition stories were either lacking in content and/or in a logical flow of ideas. The ideas presented in their composition stories could be organized in a more logical manner to minimize “gaps” and confusion to the reader.

Therefore, I found it necessary to design a class based AR to investigate if an oral discourse based approach in teaching composition writing would lead to an overall improvement in the quality of my pupils' composition stories, thus helping them to achieve better scores in their subsequent composition writing tasks.

Participants

The participants were a mixed ability class of thirty Primary Two pupils of about eight years old and myself, as teacher researcher.

Setting

This class-based research was conducted over a one-year period in 2013, which consisted of four school terms. In each term, pupils did two composition writing practices over ten weeks. Towards the end of each term, they would be assigned fifty minutes to write a composition story independently and it would be graded against a Writing Rubric. The stimulus for each writing task consisted of a set of four connected pictures and pupils were required to write a narrative story, with a minimum of one hundred words.

Instructional Process

For the first two composition practices in Term 1, I referred to the guided questions that were printed alongside the given stimulus, which was prepared for the whole level. I discussed the questions with my pupils and they jotted notes on their paper. Thereafter, they proceeded with their writing tasks individually. However, for the graded piece of writing that was assigned at the end of the term, there would be no discussion at all and pupils were left to write their composition stories individually within the stipulated time.

From Term 2 onwards, I started using a complete oral discourse based approach for teaching the two composition writing practices. I spent about eight periods (or about four hours) to conduct explicit teaching and discussion of the given stimulus through a detailed oral discussion with my pupils. Time for pupils' individual writing was also factored in.

The discussion of the picture stimulus took about 4 periods (or two hours). Pupils began by carefully studying the picture stimulus and they shared their overall impression of the events leading to the problem. Next, pupils drew arrows to connect the given helping words to the related part(s) on the picture stimulus (see *Appendix 1*). Thereafter, I would conduct a detailed oral discussion of each picture in the stimulus, and pupils were instructed to jot notes on their given set of pictures. Throughout, I led the class discussion by posing questions systematically to direct pupils in coming up with ideas in a sequential manner to construct the composition story orally, from beginning to ending.

Pupils were constantly reminded of the importance in writing about the "seen" and "unseen" parts in the picture stimulus. This served to explain the transition between the four pictures, which I described as the "invisible Z". Listed below are some examples of the questions that were posed to help pupils "see" the plot development:

1. How are the characters in the pictures related?
2. Is there a change in the location of each picture?
3. Are there any new character(s) in each picture?
4. What do you think happened behind the scene in each picture?
5. How can we break-down the development of the events into incremental steps?

During the oral discussion stage, all suggested ideas were discussed aloud and checked for logic, before they were listed in phrases and numbered in sequence on the whiteboard or on an A4-paper (see *Appendix 2* for a sample of the compilation of ideas generated during the oral discussion stage for a picture stimulus about a fire that broke out in a kitchen).

Where necessary, I also intervened by using dramatization to "act out" the flow of ideas, to ensure that pupils were able to visualize and check if the listed ideas were flowing logically. As a norm, the

minimum number of ideas generated during the oral discussion for any given stimulus was about thirty. Individual writing by pupils only took place after the oral discussion was completed.

To enable me to reflect and improve the way I carried out the oral discourse approach in my teaching of composition writing, I recorded segments of my lessons with the help of parent volunteers (who frequently help out in my lessons). My pupils also viewed the videos, for the purpose of helping them "see themselves in their thinking process". On a separate note, I subsequently had the opportunity to share these videos with my fellow colleagues as part of staff training within the school and at the schools' cluster level.

Subsequently, in Term 3, instead of listing the ideas on the whiteboard, I introduced a graphic organizer in the form of a Plot Graph, as shown in Figure 2 below. The Plot Graph serves as a sequence chart to illustrate how the ideas generated a logical flow as a series of events. All ideas were recorded and organized under one of the six headings as shown below on the Plot Graph:

1. Opening Events
2. Rising Action
3. Problem
4. Climax
5. Falling Action
6. Closing Events

These six headings typically form the structure in most narrative composition stories.

Ideas that were discussed and accepted were numbered in sequence on the Plot Graph. This allowed pupils to see how related ideas could be recorded under the same heading and clustered into paragraphs. With all the ideas listed on the Plot Graph, pupils did not need to refer to the picture stimulus when they started on their actual writing.

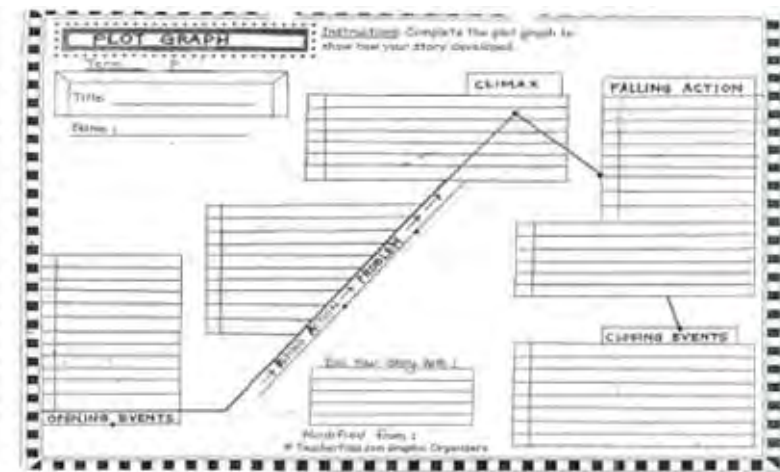


Figure 2: The adopted Plot Graph Approach

During the writing stage, I would constantly remind pupils to use connectors, to join related ideas and form longer sentences. I would also walk around the classroom to read pupils' actual writing and suggest modifications to their text, where necessary. At this stage, pupils were constantly reminded to highlight the helping words given to them once they had used them in their writing. Pupils also had to identify the type of "Starting" and "Ending" for their composition writing, by referring to the sentence starters that were found in a set of writing tips that I had compiled.

Data Sources and Data Collection

Pupils' individual scores and the average writing scores for the class (referred to as "Class E") for the four pieces of composition writings that were graded against a rubric at the end of Term 1, Term 2, Term 3 and Term 4 are recorded in Table 1 below. Comparison of pupils' composition scores between each consecutive term is also shown in Table 1. Pupils' names are not revealed but instead, writer codes are used to classify pupils as "Strong (S)", "Average (A)" or "Weak (W)" writers.

Pupils' Code in Term 1	Term 1	Term 2	Term 3	Term 4	Pupils' Code in Term 4	Term 1 to Term 2	Term 2 to Term 3	Term 3 to Term 4	Performance in Term 1 compared to Term 4	
W1	8	10	12	11	W1	2	2	-1	improved	+3m
W2	7	11	10	11	W2	4	-1	1	improved	+4m
W3	8	10	11	10.5	W3	2	1	-0.5	improved	+2.5m
W4	10	15	14	13	A1	5	-1	-1	improved	+3m
W5	12	12	12	13.5	A2	0	0	1.5	improved	+1.5m
W6	12	13	14	13.5	A3	1	1	-0.5	improved	+1.5m
W7	7	13	13	10.5	W4	6	0	-2.5	improved	+3.5m
W8	11	14	14	10.5	W5	3	0	-3.5	drop	-1.5m
W9	11	12	14	14.5	A5	1	2	0.5	improved	+3.5m
W10	8	10	13	13	A6	2	3	0	improved	+5m
W11	11	12	11	13	A7	1	-1	2	improved	+2m
W12	12	12	15	14.5	A8	0	3	-0.5	improved	+2.5m
W13*	10	10	11	13.5	A9	0	1	2.5	improved	+3.5m

Pupils' Code in Term 1	Term 1	Term 2	Term 3	Term 4	Pupils' Code in Term 4	Term 1 to Term 2	Term 2 to Term 3	Term 3 to Term 4	Performance in Term 1 compared to Term 4	
W14	8	13	13	12.5	W6	5	0	-0.5	improved	+4.5m
W15	10	12	12	13	A10	2	0	1	improved	+3m
W16	10	4	4	9.5	W7	-6	0	5.5	drop	-0.5m
<i>Average Score of Weak Writers</i>	9.7	11.4	12	12.7						+2.5m
A1	13	14	20	20	S1	1	6	0	improved	+7m
A2	15	17	12	18	S2	2	-5	6	improved	+3m
A3	14	18	18	20	S7	4	0	2	improved	+6m
A4*	15	14	17	17	S9	-1	3	0	improved	+2m
A5	13	13	13	14.5	A4	0	0	1.5	improved	+1.5m
A6	15	16	15	18	S10	1	-1	3	improved	+3m
A7	13	16	17	16	S13	3	1	-1	improved	+3m
<i>Average Score of Average Writers</i>	14	15.4	16	17.6						+3.6m

Pupils' Code in Term 1	Term 1	Term 2	Term 3	Term 4	Pupils' Code in Term 4	Term 1 to Term 2	Term 2 to Term 3	Term 3 to Term 4	Performance in Term 1 compared to Term 4	
S1	19	16	17	18	S3	-3	1	1	drop	-1m
S2	16	12	18	20	S4	-4	6	2	improved	+4m
S3	16	17	16	17	S5	1	-1	1	improved	+1m
S4*	16	17	17	19	S6	1	0	2	improved	+3m
S5	17	18	18	20	S8	1	0	2	improved	+3m
S6	18	15	18	19.5	S11	-3	3	1.5	improved	+1.5m
S7	16	14	17	18	S12	-2	3	1	improved	+2m
<i>Average Score of Strong Writers</i>	16.9	15.6	17.3	18.8						+2m
<i>Average Score of Class E</i>	12.4	13.3	14.2	15.1						

Note: The asterisk () shown beside writer code S4, A4 and W13 indicates that the composition scripts of these three writers were typed verbatim and kept for analysis.*

Table 1: Pupils' Writer Codes and Individual Composition Scores of Pupils in Class E over 4 Terms

Based on the writing performance of Class E pupils at the end of Term 1, the “Average” writers scored between 13 and 15 marks (out of 20 marks). The “Strong” writers scored above 15 marks and the “Weak” writers scored below 13 marks.

In Term 1, Term 2 and Term 3, a 5-Point Rubric with descriptors in these four areas was used to grade pupils’ composition writings:

1. Relevance of Ideas
2. Organisation of Ideas
3. Sentence Construction
4. Conventions

As for Term 4, a 10-Point Rubric with descriptors in these two areas was used to grade pupils’ composition writing:

1. Ideas and Organisation
2. Language

For Term 3 and Term 4, comparison of Class E’s writing performance vis-à-vis the other eight Primary Two classes was made possible due to a central collection of data by the English department, for the purpose of analysis.

As part of the school's marking procedure, there was a standardisation process before English teachers conducted the common marking of pupils’ composition scripts. Pupils’ scripts were marked by two teachers and the two sets of marks were averaged.

Table 2 below shows the data collected in Term 3, which focused on pupils’ scores in their “Relevance of Ideas”.

Numbers of Pupils Scoring:						
	4 – 5 marks		3 marks		1 – 2 marks	
Class A	14	48%	14	48%	1	4%
Class B	18	60%	10	33%	2	7%

	Numbers of Pupils Scoring:					
	4 - 5 marks		3 marks		1 - 2 marks	
Class C	7	23%	20	67%	3	10%
Class D	12	40%	16	53%	2	7%
Class E*	17	56%	12	40%	1	4%
Class F	7	23%	19	64%	4	13%
Class G	10	33%	15	50%	5	17%
Class H	9	38%	11	46%	4	16%
Class I	3	11%	17	61%	8	28%

Table 2: Pupils' Scores for "Relevance of Ideas" in Term 3 for the Primary 2 Level

In Term 4, data collection by the level captured pupils' overall composition scores out of a total of 20 marks. This data is recorded in Table 3 below.

	Numbers of Pupils Scoring:					
	18 - 20 marks	15 - 17 marks	11 - 14 marks	8 - 10 marks	7 marks and below	Total Pupils
Class A	4	9	16	2	0	31
Class B	4	9	13	4	0	30
Class C	5	8	12	4	0	29
Class D	1	12	14	2	0	29
Class E*	10	5	14	1	0	30
Class F	5	11	13	1	0	30
Class G	2	11	13	3	1	30

	Numbers of Pupils Scoring:					Total Pupils
	18 - 20 marks	15 - 17 marks	11 - 14 marks	8 - 10 marks	7 marks and below	
Class H	1	6	14	3	0	24
Class I	1	7	14	5	1	28
P2 Level Performance	33	78	123	25	2	261
(in terms of %)	(12.5%)	(30%)	(47%)	(9.5%)	(1%)	(100%)

Table 3 Composition Scores out of a Total of 20 marks for the Graded Writing Piece in Term 4 for the Primary 2 Level

The graded composition writings done by Class E pupils at the end of Term 4 were kept for the purpose of analyzing the quality of the written composition stories. The objective was to investigate the effects of the oral discourse approach on the year-end composition stories written by the three different groups of writers.

In addition, the Term 1 and Term 4 composition scripts of three selected pupils from the three groups of writers (namely writer codes S4*, A4* and W13*) were typed verbatim and analysed in greater detail, to study the effects of the oral discourse approach on the quality of the composition writings by these three pupils. Notes gathered from analysing the six scripts are recorded in Table 4 below, with the focus being: (1) the number of paragraphs written, (2) the number of sentences written and (3) the total word count.

	<u>“Strong Writer”</u>	<u>“Average Writer”</u>	<u>“Weak Writer”</u>
	<u>Code: S4*</u>	<u>Code: A4*</u>	<u>Code: W13*</u>
<u>Number of Paragraphs</u>			
<i>Term 1</i>	4 paragraphs	3 paragraphs	3 paragraphs
<i>Term 4</i>	7 paragraphs	4 paragraphs	5 paragraphs
<u>Number of Sentences</u>			
<i>Term 1</i>	23 sentences	20 sentences	12 sentences
<i>Term 4</i>	24 sentences	15 sentences	18 sentences
<u>Word Count</u>			
<i>Term 1</i>	242 words	192 words	154 words
<i>Term 4</i>	388 words	188 words	171 words

Table 4 Analysis of the Graded Writing Piece in Term 1 and Term 4 for Writer Codes: S4*, A4* and W13*, based on the same Picture Stimulus

Data Analysis and Discussion

As shown in Table 1, there was a progressive improvement in the average writing scores of Class E pupils over each of the four terms; with an increase from 12.4 marks (Term 1) to 13.3 marks (Term 2) to 14.2 marks (Term 3) and to 15.1 marks (Term 4) out of a total of 20 marks. The average writing scores within the “Strong”, “Average” and “Weak” writer groups over each of the four terms also showed a progressive improvement.

The data in Table 1 was also consistent with the findings by Lester S. Golub (1970), in that the use of the oral discourse “produced more grade increases and fewer decreases in written discourse”. Indeed, there were more counts of grade increases than grade decreases between each consecutive term. Thus, it indicates that the improved writing performance of Class E pupils over the four

terms was not due to a small handful of pupils, but rather it was an across the board improvement. I did note that Table 1 also shows that from Term 3 to Term 4, there was a drop in the average scores for certain "Weak" writers (by a slight 0.5 marks) and for two pupils (a drop of 2.5 and 3.5 marks). In my school, the Term 4 writing assessment is always tougher than Term 3. As such, this again suggests that the "Weak" writers had also improved via the new oral discourse approach. Otherwise, a more significant drop could be anticipated.

By the end of Term 3, as shown in Table 2, Class E had the second highest percentage of pupils scoring within the top band in "Relevance of Ideas", for the graded piece of composition writing.

By Term 4, as shown in Table 3, Class E recorded the highest percentage of pupils who scored within the top band in terms of overall composition scores for the graded piece of composition writing. This percentage is significant when compared to the performance by the other Primary Two classes.

Referring to Table 1's classification of the three writer groups in Class E, the "Strong" and "Average" writers made up about 23.5% each, whilst the "Weak" writers made up 53%. However, by the end of Term 4, there was an overall upward movement of pupils becoming better writers. The percentage of "Strong" and "Average" writers in Class E increased to 43% and 33.5% respectively.

The positive effect of the oral discourse approach was also observed in the composition scripts belonging to the three selected writers: S4*, A4* and W13*. A summary of the observations made is recorded in Table 4.

For "Strong" writer code S4*, although there was only an increase of one more sentence (from 23 sentences in Term 1 to 24 sentences in Term 4), the word count showed a significant increase of 146 words. This was due to a better plot development. There was also a better use of paragraphs to group related ideas. The development of ideas was well-sequenced, there was good use of connectors to

combine sentences and a good use of time markers to show the movement of events in the composition writing.

As for the "Weak" writer code W13*, there was also an increase in the number of sentences written (from 12 sentence in Term 1 to 18 sentences in Term 4) and an increase in word count of 17 words. There was a clearer flow of plot development in the pupil's writing. However, there was limited use of sentence combining in the pupil's writing. This pupil certainly wrote a more coherent composition story as compared to his written composition story in Term 1, as his composition score at the end of Term 4 was the highest he achieved in that year.

As supported in a research paper by Cotton (1988), she cited that:

Glatthorn (1981) and a number of other researchers had pointed out that merely spending more time writing, or writing a greater number of papers does not, in itself, increase writing skills. However, when the approach to writing instruction emphasizes process, and when the instructional techniques used are those shown to be effective, increases in amounts of writing time and practice have been shown to improve achievement. (p. 7)

Despite the positive effects as stated in the above paragraphs, there still appears to be a clear distinction in the quality of the written composition stories between the three groups of writers. The plot development presented in the composition stories written by the "Strong" writers were generally more interesting. There was cohesion in the sequencing of ideas in most parts of their composition story. However, for the "Weak" writers, certain parts of their composition stories were still lacking in plot development and at times, there was no further elaboration of the written idea. But nevertheless, it was encouraging to note that, in their composition writings, there was an overall improvement in their story sense.

The data analysis does lend support to using an oral discourse approach in teaching composition writing to young children. The oral discussion platform which is the essence of the oral discourse approach had possibly led to a positive effect on the development

of pupils' thinking processes. In allowing the teacher and pupils to discuss aloud and generate ideas in a sequential "step-by-step" manner to connect the four pictures in the given stimulus, pupils were required to exercise logic in analyzing and justifying their sequence of events. Hence, pupils' rhetorical thought problems were possibly addressed during the discussion stage. And in so doing, pupils became more aware of missing links in their written sentences.

By moving from an oral discussion stage to informal writing (of ideas) and finally to composing an oral composition before the written composition, pupils received the needed guidance to help them in their writing. All these stages must have helped pupils to write a more complete composition story.

But sadly, I also share the view that it is difficult for "Weak" writers to acquire the same flair in composition writing that "Strong" writers possess. While sentence structure and other specific mechanics of the English language can be learnt, originality and fluency in written expression depends much on individual writer's command of the language. Expectedly, those with a better command of the language will have a better understanding of what is taught and be able to apply it to produce a richer piece of composition writing. Perhaps, this may be a possible area for further research.

Personal Learning and Reflection

In the course of my research, I came across the work of Dick (2002) and Tay and Lim (2007) and I began to realize that my composition teaching approach can be seen as progressing through four dialectics, based on the Dialectic Soft Systems Methodology. In Figure 3 below, I have attempted to map the key stages of my approach in the teaching of composition writing by using the Dialectic Soft Systems Methodology.

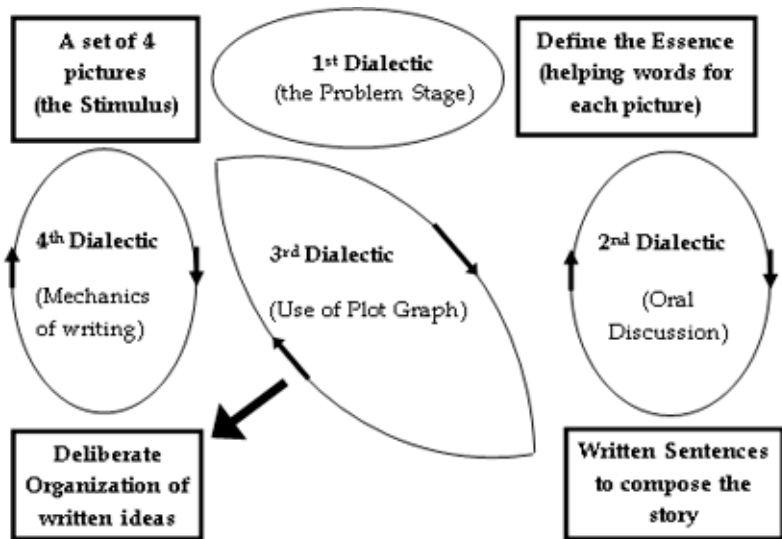


Figure 3: Key Stages of Author's Approach in Teaching of Composition Writing using the Dialectic Soft Systems Methodology

1st Dialectic - This stage takes place between immersion (the picture stimulus) and essence (helping words for each picture), where a pupil tries to make sense of the problem situation (the picture stimulus) as fully as possible and then consider how the four pictures in the stimulus are connected to form a story. This stage helps pupils to determine the scope of coverage for each picture.

2nd Dialectic - This stage takes place between the essence and drafting of a minimum number of ideas to compose the composition story, whereby each pupil finds an ideal way to translate the helping words into a sequential listing of ideas in short phrases to form a coherent story.

3rd Dialectic - This stage takes place between the written ideas and the story as illustrated in the four pictures, where the pupil thinks about improvement at the rhetorical level via the use of the Plot Graph. First, pupils will use the "arrows and numbered boxes" in a

Plot Graph to establish a sequence of events leading to the climax and its resolution. Second, from the established visual flow, pupils will introduce additional interesting information and interpretations to the storyline gathered in the 2nd Dialectic. Typically, pupils will attempt to draw insightful distinctions and to frame new conceptions in a step-by-step manner from start to end. Third, pupils may provide additional reasons to show logically why their conclusions are reasonable. In other words, the outcome of this stage is the deliberate organization of ideas under the six headings found in the Plot Graph and with broadening the range of perceptual experiences (as gathered from the given pictures) and exercising imagination.

4th Dialectic - This stage takes place between the deliberate writing of sentences and the story as illustrated in the four pictures, wherein the pupil becomes concerned with the mechanics of writing grammatically correct sentences and in applying his/her unique individual writing style.

By consistently using the oral discourse approach over the four terms, my pupils seemed to have internalized a set of thinking skills and a system that had helped them to write better composition stories and achieve higher scores in their individual writing tasks at the end of Term 4.

In essence, as reflected in this research study, we need to induce the aesthetic pleasure within each pupil in order for them to become better writers. Huntley (1970) suggested three steps to kindle the spark of aesthetic feeling into a flame that is summarised as follow: "To induce aesthetic pleasure: Select a suitable object; acquire the relevant education; and help yourself" (p. 2).

First, if we seek to implant in the budding pupil a feeling for beauty in composition topics, then we must expose the pupil with beautiful specimens. No argument would convince a blind man of the beauty of a rainbow; he or she must see it. The picture stimulus phase and problem phase of the oral discourse approach offers this first feature by providing pupils with some preliminary education

in familiarizing themselves with the selected specimens (that is, the set of four pictures) through the teacher's and pupils' sharing of common class experiences, as well as personal experiences.

Second, we need to recognize the fact that the path to real aesthetic pleasure is through toil. In other words, a limited sense of aesthetic appreciation is given via the picture stimulus phase and problem phase; the rest must be acquired through the oral discussion phase and written discussion phase of the oral discourse approach. For example, the musically uneducated can easily appreciate a musical tune. But, a complete 30-Bar storyline is reserved for the musically trained; it is acquired. However, instead of "toil", it is the engaging and lively interactions offered by the oral discourse approach that allow pupils to acquire the relevant thinking and writing skills.

Third, each pupil must be encouraged and must attempt to help himself/herself. By having in mind the notion of the Dialectic Soft Systems Methodology, pupils become more aware of the approach they should take when they attempt to write a composition story based on any set of picture stimuli, whether at home or in school and especially during formal composition writing assessments, with a view to develop and empower the pupils' rhetorical thought processes. The appreciation of beauty is scarcely to be distinguished from the activity of creation. "In the moment of appreciation we ... re-enact the creative act, and we ourselves make the discovery again" (Huntley, 1970, p. 2). As such, the weak writers are able to re-discover the ideas of strong writers within this third step of Huntley's suggestion. Thus, the cycle is complete.

The classroom-based oral discourse approach offers the first and second step of Huntley's suggestion whereas the notion of the Dialectic Soft Systems Methodology approach addresses Huntley's third suggestion. Therefore, by repeating the cycle of Huntley's suggestion over four terms of an academic year, I believed that I did manage to kindle the spark of coherent writing into a flame for each of my pupils.

Conclusion

The findings based on quantitative data showed an improvement in my pupils' writing performance after I adopted the oral discourse approach in teaching composition writing. I attribute the improvement in content and coherence in my pupils' composition stories to the collection of ideas generated during the detailed oral discussion that took place in the classroom between pupils and me.

The vigorous process of questioning the logic of each suggested idea, before it is listed down in a "step-by-step" manner, helped pupils to trace the story development from start to end. The oral discussion platform encouraged pupils and teacher to exercise critical thinking skills to check that the flow of ideas makes good story sense. This is essential for composing a coherent piece of composition writing. By taking pupils through the rhetorical thought process of generating ideas, pupils became more aware of what was needed of them, to write a more complete composition story through the logical conjoining of ideas into words and finally into sentences and paragraphs.

In summary, the positive results obtained in this research study suggest that the oral discourse approach is a worthwhile venture for fellow teachers to try out in the teaching of English composition writing in their classrooms.

Acknowledgement

I would like to specially thank Dr Tay Boon Hou from Research@EastZone for his suggestions on ways to improve my paper and not forgetting his patience and his time spent in vetting it.

I would also like to thank Mrs Chong Mee Ying, Principal of St. Hilda's Primary School, for her permission in the conduct of this action research, as well as in providing the opportunity to share the findings of my research with fellow teachers.

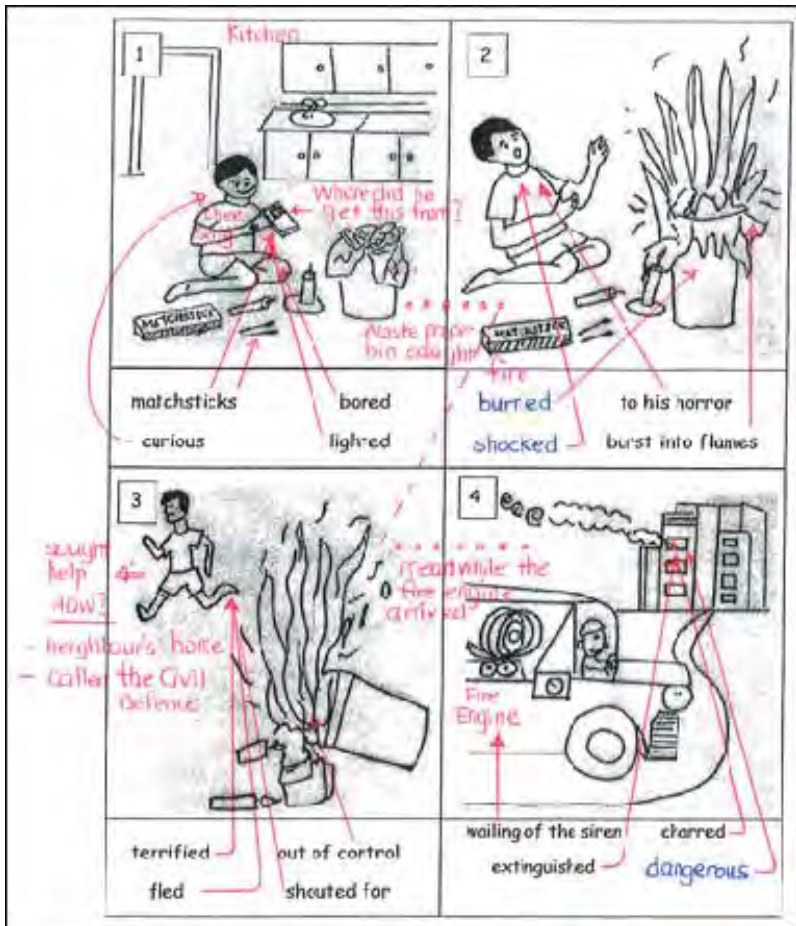
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Biography

Christina Wong is a teacher at St Hilda's Primary School. In 2006, her action research on journal writing for mathematics was presented at the WALs Conference in Hong Kong. In July 2014, she presented her second action research project on teaching English composition writing using an oral discourse approach at the ISSS Conference in Washington DC, USA.

Appendix 1



Appendix 2

Suggested ideas as to why XX was able to play with fire ...

- Eg: → all alone at home
- saw a box of matchsticks on the kitchen table
 - naughty thought came into XX mind
 - took out a candle and a few matchsticks
 - lighted one of them

Step-By-Step Ideas that were Generated for Pic 1 Pic 2 Pic 3

- 1) next ... lighted a candle
- 2) ... excited ... accidentally ... elbow knocked the candle
- 3) candle tipped over
- 4) wastepaper basket that was beside the candle caught fire ... shocked ...
- 5) ... paper in the basket burned quickly
- 6) ... basket burst into flames ... terrified ...
- 7) fire got out of control
- 8) grabbed a cloth from the kitchen stove
- 9) flapped the cloth ... tried to put out the fire
- 10) instead the fire got bigger
- 11) to his horror ... the fire spread to the wooden kitchen table / floor mat
- 12) the fire got out of control
- 13) fled from the kitchen to the living room / neighbour's house
- 14) "... include a speech ..." XX shouted for help
- 15) his neighbour heard his cries for help
- 16) meanwhile, XX was at his neighbour's house

Picture 4

- 17) neighbour rang ... the Civil Defence for help
- 18) about twenty minutes later, ...
- 19) heard the wailing of the siren coming from ...
- 20) fire engine arrived
- 21) four firemen carried their fire extinguishers and entered the ...
- 22) about half an hour later, the fire was put out
- 23) XX returned to his flat and saw ...
- 24)
- 25)

Ending

- 26)
- 27)
- 28)
- 29)
- 30)

** Be sure to use the Remaining Helping Words:

- charred remains
- dangerous

** Refer to the set of Writing Tips to Identify the Best Ending for your story.

A scaffolding strategy for helping lower secondary science students construct scientific explanations for experimental based questions in science¹

Deborah Goh Hui Hui and Zulaiha Shireen Bte Mohd Salleh

Abstract

The study of science in essence involves the explanation of phenomena by inferring the reasons for occurrences and justifying the significance of the observed event. This raises a challenge for the educator: How can we equip students with the requisite knowledge and skills for answering science questions? This research study responds to this challenge by doing five things. First, it adopts an action strategy with reference to Feldman's approach to art criticism- DINE (describe, interpret, evaluate). Students adopt this action strategy to construct arguments and explanations to explain phenomena. Second, it incorporates bite-size classroom teaching to equip students with the pre-requisite knowledge. An educator teaches on a 'need-to-know' basis and focuses on context that can help students move forward in their inquiry with DINE. Third, it introduces a set of focal lessons. Each focal lesson comprises a set of step-by-step tasks to be carried

¹ A similar version of this paper was published in the Proceedings of the 58th Annual Meeting of the International Society for the Systems Sciences (<http://journals.iss.org/index.php/proceedings58th/article/view/2224>). The double-blind review associated with the preparation of this version has produced a number of changes from the earlier version, including greater emphasis of the PAR approach

out by students. Each task takes into consideration the appropriate zone of proximal development whereby the level of potential development is determined through problem solving in collaboration with fellow students (Vygotsky, 1978). Fourth, it provides the justifications for our integrated use of DINE, Bite-Size Teaching, and Focal Lesson as a collective whole via the Connective Approach as described in the works of Strawson (1992), Tay (2003), and Tay et al (2010). Lastly, it demonstrates the cycles that participants, both students and teacher researchers, experience when embarking on a participatory action research journey.

Keywords:

Participatory action research; scaffolding strategy; connective approach; zone of proximal development

Introduction

We are a team of Biology and Lower Secondary Science teachers of a public secondary school in Singapore with a student population of about 1120. Since 2012, the school has adopted a modular approach for teaching Lower Secondary Science for Secondary 1 (Grade 7) and Secondary 2 (Grade 8) Express course students. The Express course is a four-year course leading to the General Certification of Examination at Ordinary Level (GCE 'O' Level). Students will take Biology and Science Skill modules in the Secondary 1 Science course, and do Chemistry and Physics modules in the Secondary 2 Science course.

We decided to embark on this action research journey to empower our students in answering experimental based questions in science. As pointed out by Dick (2001) and Reason and Bradbury (2001) as well as reflected by the experiences described in this study, action research achieves change through its participative approach and enables this research study to be conducted by being responsive to an issue of concern.

Because we are working towards helping students overcome their difficulties in scientific explanation, it seems fitting to follow a

participatory action research method. Participatory action research (PAR) is defined as “an approach to improving social practice by changing it and learning from the consequences of change” (as cited in Stringer, Traill and Culhane, 2010, p. 7). McIntyre (2007) outlined a few tenets of PAR: (a) a collective commitment to work on an issue, (b) engaging in self and collective reflection, (c) individual or collective action that benefits participants, and (d) collaboration between researchers and participants in the process. These aims are achieved through cyclical processes of exploration, critical and collective reflection, action, knowledge construction; in the process, it changes the researcher, participants and contexts in which they participate (McIntyre, 2007). There is “no fixed formula” (McIntyre, 2007, p. 2) for designing and implementation of PAR projects; there is “malleability” (p. 3) in how PAR processes are implemented. As we proceed with the PAR journey, we adjusted our teaching approach by taking into account students’ feedback and reflections, and teacher research team discussions which led to our growing understanding of a Scaffolding Strategy to help our students learn Science.

Action Research Cycle One: Immersing in our Problem Situation

Lower Secondary Science students have some challenges in answering data-based questions in science: (1) Inability to describe the data provided (Fig. 1); (2) Inability to link scientific concepts to given data (Fig. 2).

For the first challenge (Fig. 1), our students tend to generalise loosely and prematurely in their written answers. Most students fail to put in effort to describe the pattern(s) offered by the data in a given question (Sandoval, 2003). Instead of using the data provided, students often rely on their personal views, textbook knowledge and beliefs to draw conclusions (Hogan and Maglienti, 2001). For instance, as depicted in Fig. 1, the student answered by using ‘*affects*’ in the explanation without clear mention of what exactly the effect was.

- 8 Fig. 8.1 shows the solubility of three chemicals, copper sulfate, potassium chloride and sodium chloride with respect to temperature.

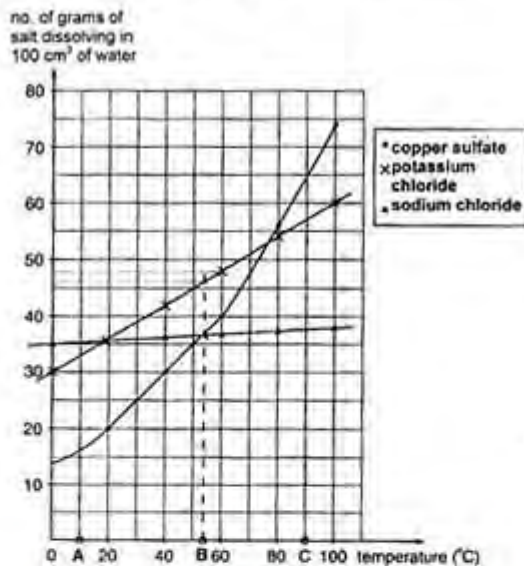


Fig. 8.1

- (a) Based on the data in Fig. 8.1, state the general hypothesis for this experiment. |
 The number of grams of salt dissolving in 100cm³ of water ~~at~~
 The temperature of water affects flow?
- (b) At temperature A, state the most soluble and least soluble chemicals. |
 most soluble Copper sulfate ✓
 least soluble Sodium chloride ✓
- (c) Estimate the solubility of potassium chloride at temperature B |
 45g/100 of water.
- (d) Estimate the temperature at which copper sulfate and potassium chloride have the same solubility. |
 0, 54°C ✓

Fig. 1: Inability to describe the data provided

With regards to the second challenge, our students are often confounded by the term 'explain' and tend to miss the linking to

concepts they have learnt. In Fig. 2, the student wrote a set of explanations that were irrelevant to the given questions. For instance, the student failed to link the question to the *concept of air pressure* in the inner and outer ear. Research findings show that even when students are able to describe and link their inference to data, they are less likely to articulate the scientific principles behind that connection (McNeill et al., 2003).

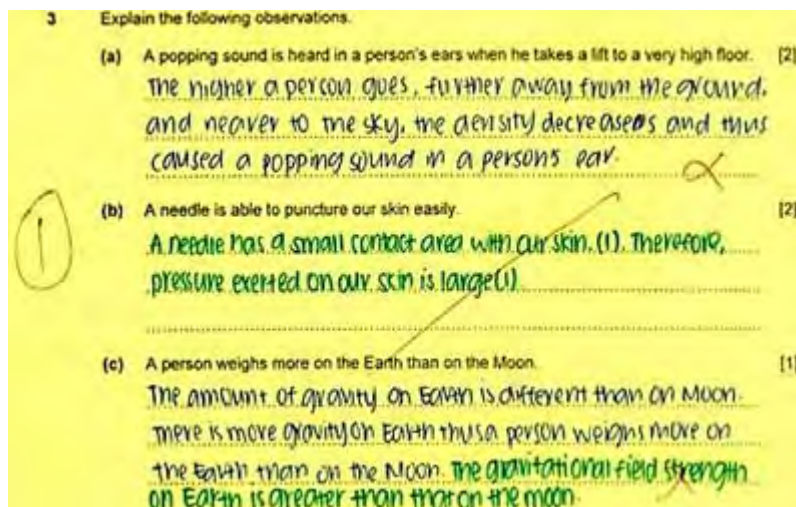


Fig. 2: Inability to link scientific concepts to given data

In the past, we have tried to explain the answering of experimental based questions on a question-by-question basis. This led to some students memorising answers to specific questions and hence, unable to develop the form of thinking involved in answering experimental based questions. There are studies indicating that the ability to craft scientific explanations does not come naturally to most individuals; instead, it is mostly assimilated through practice (Osborne et al., 2004). Therefore, students should be explicitly taught the skill on how to craft accurate scientific explanations.

After a few rounds of brainstorming sessions among ourselves, we concluded at the end of this action research cycle with the following research question:

How can a scaffolding instructional strategy be used to improve students' construction of scientific explanations for experimental based questions?

We then proceeded to the next action research cycle to determine the key ingredients to implement such a scaffolding instructional strategy.

Action Research Cycle Two: Conduct Literature Review

A core facet of science is the ability to construct explanations from interpreting evidences and assessing claims (Driver et al., 2000). The ability to derive proper scientific explanations encompasses the goal of inquiry learning because it involves understanding the phenomena and convincing others of the same understanding (Sandoval and Reiser, 2004). Students' engagement in construction of scientific explanation may promote a positive outlook on science as well as increase their understanding of scientific content (Bell and Linn, 2000; Zohar and Nemet, 2002). Therefore, we realised that to help them construct explanations, we need to put in place an action strategy that can be adopted by our students.

As pointed out by Chinn and Brewer (2001), our students' understanding of content knowledge and data in question hinges on whether they are able to provide appropriate evidence for a particular task. Students are also likely to ignore data that contradicts the theoretical knowledge they already know, and they are more likely to take data into account if they can visualise the concept behind the data pattern. Therefore, the need for stronger content knowledge and exposure to data patterns may help students improve their understanding for the underlying intention of a given science question. This has prompted the need to teach pre-requisite knowledge to our students.

Scaffolding, as described by Wood, Bruner and Ross (1976), consists of an adult manipulating the elements of task that are beyond the learner's ability, so that the learner is able to focus on and achieve competence in the fundamentals within her/his

capacity. Researchers (Brown and Palincsar, 1987) have made the connection that scaffolding allows learners to reach a higher level of understanding of task within their zone of proximal development (ZPD). According to the famed Vygotsky's (1978) theory, ZPD defines the area where a learner is able to solve problems independently and attain a potential level of problem solving capabilities with guidance. In order for a scaffold to serve its function well, it should reside within the learner's ZPD.

Besides, scaffolding can be used to make abstract processes visible for learners. For instance, a teacher can provide suggestions through modelling strategies (Brown and Palincsar, 1987) as well as prompts and questions to help learners understand the processes involved in learning (Jackson et al., 1998). Therefore, the need to consider the learners' zone of proximal development, to make abstract process visible, and to support students for constructing scientific explanation, has prompted us to design focal lessons with step-by-step instructions.

In summary, the above literature suggest that the to-be-derived Scaffolding Strategy must entail three aspects, namely,

- First Aspect: an action strategy for helping students construct scientific explanations
- Second Aspect: a lesson for teaching pre-requisite knowledge to students
- Third Aspect: a Scaffolding Lesson with tasks that take proximal development into consideration.

Action Research Cycle Three: Derivation of our Scaffolding Strategy

First Aspect: Developing the appropriate instructional strategy

Prior to our research study, the art curriculum in Singapore had already adopted Feldman's method of art criticism (1967) as a

simple four-step method for evaluating a work of art. It comprises the following:

- I. Description: listing what an art object seems to include
- II. Formal Analysis: describing the relationship among the things that were listed
- III. Interpretation: deciding what all your earlier observation means
- IV. Judgement: deciding the value of an art object

We noticed the similarities behind the Feldman thinking model of art criticism and constructing scientific explanations. We decided to adapt Feldman's model as an action strategy called "DINE", with a view to make it more accessible to lower secondary students for learning science.

DINE comprises the followings:

- Describe: State what has been observed (adapted from I of Feldman's method).
- Interpret: Explain the relationship among the variables (adapted from II and III of Feldman's method).
- Evaluate: Justify the decision or explain the concept using scientific theories (adapted from IV of Feldman's method).

Besides, we also intentionally reduced the complexity of experimental based questions for students with a view that students can collaborate among themselves in deriving valid scientific explanation (Wood et al., 1976).

Second Aspect: Preparation of bite-size notes for teaching pre-requisite knowledge

Student epistemology influences the learning experiences students have and impacts student learning (Hogan and Maglienti, 2001). As such, we took into consideration the prior knowledge of our target students and incorporated additional information on a 'need-to-know' basis, with focus on context that can help students move forward in their inquiry during the scaffolding lessons. In

Focal lesson 1, the concept of osmosis was taught to students through use of guiding slides (Fig. 3).

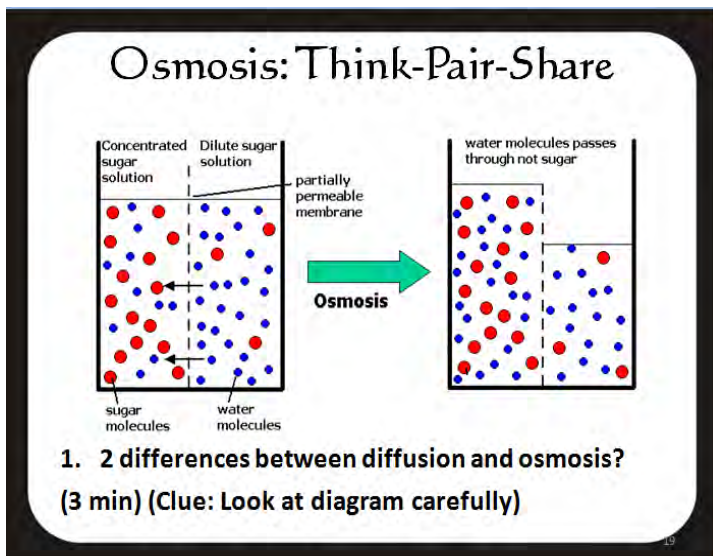


Fig. 3: Guiding slide

Third Aspect: Selection of focal lessons and materials to implement the use of DINE

We introduced three focal lessons for Biology (Appendix D), Science Skills (Appendix F), and a third one for Biology and Science Skills (Appendix G, Appendix H) collectively. Apart from the focal lessons, the team also identified daily exercise questions in the theory workbook and practical book (Marshall Cavendish Education, Science Matters) for teachers to incorporate DINE into construction of scientific explanations (Appendix B).

Fourth Aspect: Adaptation of UNSW questions for DINE pre-test and post-test

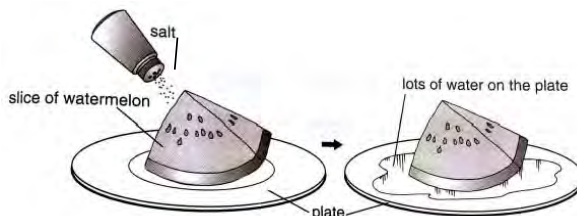
We adapted 10 multiple choice questions extracted from The International Competitions and Assessments for Schools (ICAS) Science papers administered by the University of New South

Wales (UNSW) from years 2000, 2001, 2002, 2003 and 2007 (Appendix A). The ICAS questions were chosen because the questions assess students' skills in the key scientific areas of interpreting data, applying data and higher order skills (<http://www.eaa.unsw.edu.au/forms/pdf/icas/subjects/science-framework.pdf>). We based our choice of questions on a spread of data based question types - inference, line graphs, pie charts, bar charts, tabular data (Appendix C). We administered this test before the explicit teaching of DINE to understand their pre-analytical ability for data based questions, and administered the same test after the DINE implementation period to check for improvement in their post-analytical ability.

It is important to note that in our research study, we did not conduct any pre-knowledge lessons to students for these extracted UNSW questions. This fourth aspect was introduced with a view to find out whether equipping students with DINE alone is sufficient to improve their analytical skill.

Fifth Aspect: Developing Domain pre-test and post-test

Some table salt was sprinkled on a slice of watermelon and was left untouched for 20 minutes.



After 20 minutes, a pool of water was found around the water watermelon. Explain what has happened that led to this pool of water.

Fig. 4: Example of pen and paper assessment test

Pen and paper assessment tests based on domain knowledge (Fig. 4) were developed and administered to students before the introduction of DINE and after the introduction of DINE respectively. Through this, we wanted to assess how the

preparation and teaching of domain knowledge impacted the DINE instructional strategy adopted in this research study.

Action Research Cycle Four: Our Intervention (I)

The focal lessons were carried out in chronological order and administered to a total of 160 students from four Secondary 1 Express Stream classes over 8 months collectively.

- Stage 1: Conduct UNSW DINE pre-test (Appendix A) before DINE is taught to students
- Stage 2: Conduct Domain pre-test before DINE is taught to students
- Stage 3: Students were taught explicitly the use of DINE prior to focal lessons
- Stage 4: Conduct of Focal lesson 1 (Appendix D)
- Stage 5: Conduct of Focal lesson 2 (Appendix F)
Participants' (students and researchers) feedback and reflections on Focal lessons

The activities from Stage 4 and 5 are described in detail in this chapter.

Stage 4: Focal lesson 1 (Biology practical)

In the selected Biology practical on diffusion and osmosis (Appendix D), students were tasked to carry out the experiment on osmosis using potato strips and a sucrose solution, and use DINE to analyse their data.

Step 1: Students participated in the practical session and collected the tabular data on their own (Fig. 5).

	Initial length /cm	Final length /cm	Difference in length /cm	Texture and appearance
Strip in water	6.0	6.8	+0.8	rough, hard
Strip in 20% sucrose solution	6.0	5.4	- 0.6	smooth, soft
Strip in 10% sucrose solution	6.0	5.6	-0.4	smooth, soft
Strip in 5% sucrose solution	6.0	5.9	-0.1	smooth, soft
Strip in 1% sucrose solution	6.0	6.3	+0.3	rough, hard
Strip in 0.5% sucrose solution	6.0	6.5	+0.5	rough, hard

Fig. 5: Student data

Step 2: Students worked collaboratively in groups of 4 and used DINE to answer two questions: 'Explain what happens to the potato strip when placed in distilled water?' and 'Explain what happens to the potato strip when placed in 20% sucrose solution?'. They answered the questions in a Google document that allowed students to collaborate and share answers with a view to help each other develop a better understanding of construction of scientific explanations.

Step 3: Each student participated as a 'teacher' and was allocated one part of explanation done by another group to critique; i.e. Student A critiqued on the 'Describe' statement done by Group 1, Student B would critique on the 'Interpret' statement done by Group 1.

Step 4: Teacher conducts a general feedback session for the class on how DINE can be useful to help in construction of scientific explanation.

Stage 5: Focal lesson 2 (Science Skill workbook exercise)

Teachers selected a question from the Science workbook (Appendix F) that did not focus on data management through tables and graphs but had observation and inference components. We intended students to view DINE to be applicable for use across most question types.

Step 1: Students attempted the workbook question on their own using DINE.

Step 2: Teacher walked about the class to support students' construction and went through the question as a whole using the DINE approach.

Action Research Cycle Five: Data Collection and Interpretation (I)

Qualitative report of students' feedback (after Stage 5)

Using an online survey platform, we created a survey for the students after the implementation of DINE instructional strategy in Focal Lessons 1 and 2 to gather feedback on the usefulness of the strategy (Fig. 6).

* 3. Which type of question of data-based questions (DBQ) do you find the easiest?

Line Graphs
 Tables
 Diagrams
 Pie charts
 Descriptive paragraphs
 Other (please specify)

* 4. Do you find the DINE method (Define, Interpret, Evaluate) taught to you earlier to answer structured or essay questions effective?

Yes
 No

* 5. What can be improved on for DINE?

Fig. 6: Feedback questionnaire

The results for Question 3 are shown in Fig. 7. From the data, it shows that students find analysis of tabular data to be the easiest.

The lack of confidence in constructing scientific explanations from evidence found in descriptive paragraphs may stem from the poor foundation in language ability to analyse texts. Fig. 7 may be a good indicator of the amount of prior exposure the students have to the different question types.

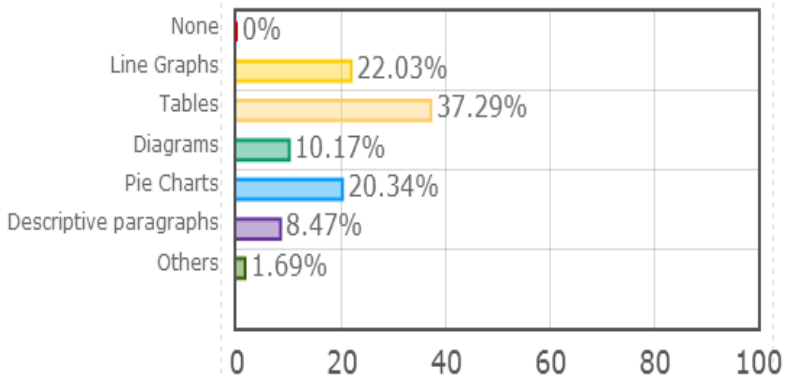


Fig. 7: Question 3 results

For Question 4, it seems that an 85% majority of students do see the need for a structured approach to help train skills for construction of scientific explanations (Fig. 8).

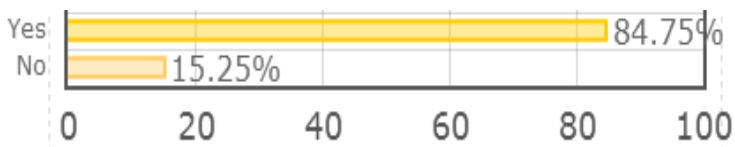


Fig. 8: Question 4 results

The students' comments for Question 5 are listed in Fig. 9.

positive	areas for improvement
<ul style="list-style-type: none"> • Nothing; it is good enough • DINE has already covered all the question needed for explanation question as long as we follow the DINE approach there shouldn't be any other things to add on hence i think the DINE approach is good enough. 	<ul style="list-style-type: none"> • Teachers can explain the way of answering questions using this method better as students may not know when and how to use this method when a question is given to them to answer. They can also <u>give some examples</u> of students answering the questions correctly using the DINE method. • For example the IN in DINE, the meaning is to Interpret. It is <u>not really clear</u> what to interpret when you already describe your answer. • Use it <u>more often</u> for most questions and also expand its use to elaborate answers longer. • The DINE method can be improved by adding on <u>extra information</u> about the method and tips on how to answer the questions with better answers when using the DINE method. • Outdoor experiments makes questions related/requires the DINE method makes it more easy and fun to do.

Fig. 9: Student comments to Question 5

This feedback from students about areas for improvement helped us refine Focal lesson 3.

Qualitative analysis of students' peer critique

In Focal lesson 1, when students were given the ownership to participate and critique their peers' DINE explanations, it seemed that they were better at pointing out the missing gaps.

“(a) ...although all three statements are correct, the whole explanation does not make sense... The group only provided the definition of osmosis and even the explanation is incomplete (what does the water molecules pass through?).” (Appendix E, emphasis added)

In comment (a), he/she accurately pinpoints the mistakes that students have been making over the years- they are able to reproduce theoretical knowledge, but unable to link that domain knowledge to the context in the question given.

- (b) “You should be more specific and state it as “potato strip” instead of potato as there’s a difference between a whole potato and just a strip.” (Appendix E)
- (c) “The definition is incomplete, they should have mentioned ‘osmosis’ in their answer as it is a key word...” (Appendix E, emphasis added)

In the critiques (b) and (c), students echo the common mantra of teachers for students to be *more specific* in writing their scientific explanations- students tend to be careless with use of scientific terms in their daily work.

Through this peer critique activity, students have showed us how they interpret DINE strategy. We have observed general improvements in students’ construction of explanations when they participated as ‘teachers’ in critiquing their peers. Together with positive feedback of the DINE strategy from the student survey reflections, we are convinced by the benefits of our implementation so far and proceeded to refine our intervention.

Action Research Cycle Six: Our Intervention (II)

With feedback input from students and reflections from researchers after Stage 5, we decided to improve our intervention design for Focal lesson 3. The stages for the second part of our intervention continue from the first part of our intervention.

Stage 6: Conduct of Focal lesson 3 (Appendix G, Appendix H)

Stage 7: Conduct UNSW DINE post-test (Appendix A)
Researchers’ reflections on data collected from Stage 1 to 7

Stage 8: Conduct Domain post-test after implementation of DINE focal lessons
Researchers’ reflections on data collected from all interventions

The improvements to intervention made are described in detail in this chapter.

Firstly, in students' feedback after Stage 5, it was mentioned that "it is not very clear what to interpret" and that DINE should be used "more often for most questions". This led us to develop a poster for DINE which clearly delineates the criteria for understanding the aspects of Describe, Interpret and Elaborate. The poster was printed for every science classroom and exhibited on the classroom walls. It is a step towards making DINE more visible in classrooms which hopefully increases the frequency of its use. Fig. 10 shows the poster developed.

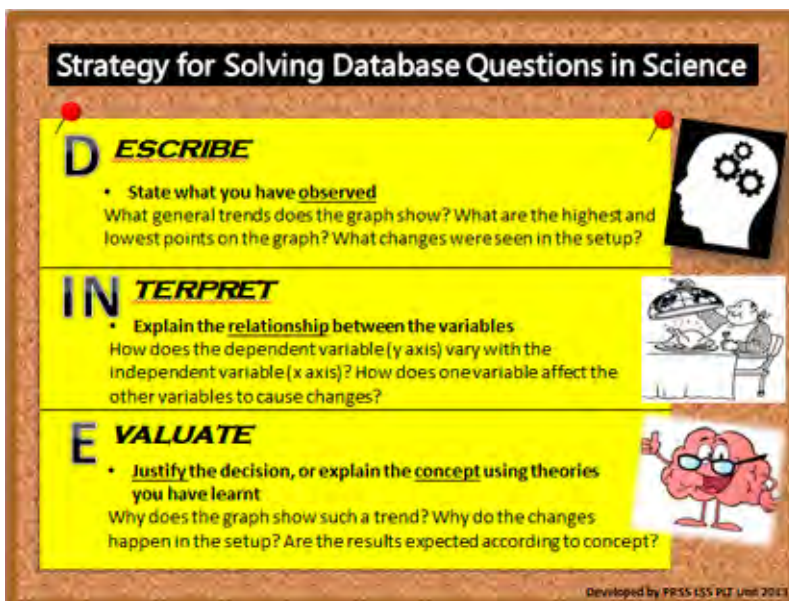


Fig. 10: DINE poster

Next, students mentioned in their feedback that outdoor activities will make using DINE "more easy and fun to do" and more examples would be welcomed. We refined our Focal lesson 3 to include experiential learning activities to engage the students as well as hope that they will be able to gain deeper insight into crafting scientific explanations when given the autonomy to design their own experiments.

Stage 6: Focal lesson 3 (Biology + Science Skill eco-garden lesson)

Focal lesson 3 was carried out in two separate lessons - Focal lesson 3 Part 1, exploration of school eco-garden and generating inquiry questions (Appendix G) and Focal lesson 3 Part 2, using DINE to construct scientific explanations (Appendix H).

Step 1: In Focal lesson 3 Part 1, students were brought down to the eco-garden to observe the biodiversity there and derived their own inquiry questions and hypotheses (Appendix G) using the worksheet provided (Appendix I). In groups of four, they designed a simple experiment to test out their hypotheses and included the type of data they were collecting. At the end of the lesson, the teacher collected the worksheets (Appendix I).

Step 2: In the time period between Focal lesson 3 Part 1 and Part 2, the teacher came up with fictitious data in tabular form that was customised to the hypotheses and experiments of each group (Fig. 11).

	with support			without support		
week	1	2	3	1	2	3
height of plant (cm)	15	25	37	15	18	19

Fig. 11: Example of fictitious data

Step 3: In Focal lesson 3 Part 2, the teacher returned with fictitious data generated for each group (Appendix H). Using the guided worksheet (Appendix J), groups used DINE to construct scientific explanations for their hypotheses. During the session, each group had to use the data provided to Describe, *'What are the highest and lowest readings?'*, Interpret, *'What do these readings signify? Is the trend of the data increasing, decreasing or constant and what does it mean?'* and Evaluate, *'Give a conclusion to your hypothesis, stating whether it was possibly true or possibly false, and why'*. The teacher collected the worksheets and assessed students' ability to construct scientific explanations.

Action Research Cycle Seven: Data Collection and Interpretation (II)

Quantitative analysis of UNSW DINE pre- test and post- test

Marks were allocated based on 1 mark per correct answer, with a maximum scoring of 10 marks. We conducted a paired sample t-test to examine whether there is a significant improvement in the mean marks of post-test compared to the mean marks of pre-test of all the four classes (Fig. 12).

class	pre-test mean (out of 10)	post-test mean (out of 10)
P	6.5	6.8
Q	6.1	6.7
R	5.6	6.1
S	6.5	6.6

Fig. 12: Mean marks t-test results

Only for class Q, the absolute value of the t stat was smaller than the t critical two tail and the probability that the null hypothesis is true is smaller than alpha ($p=0.0012$). For class P, R and S, there was no significant statistical difference between the mean of pre-test and post-test scores.

The UNSW DINE pre-test and post-test developed assesses students' ability to analyse data based questions without the need for domain knowledge. With these findings, we can postulate that measurement of the DINE strategy alone is insignificant. In other words, we realized that equipping students with just DINE approach alone is not sufficient for students to learn science.

Despite insignificant quantitative results from UNSW tests, the positive students' qualitative feedback, both from students' reflections after Stage 5 and qualitative analysis from students' artefacts, convinced us that domain knowledge had to play a role in formation of students' understandings of crafting scientific explanations. Therefore, we did a quantitative analysis of their domain test results.

Quantitative analysis of Domain pre-test and post-test with DINE approach taught

We conducted a paired sample t-test to understand if there is a significant improvement in students structuring scientific explanations using DINE, in assessment tests which require domain knowledge.

	domain pre-test	domain post-test
mean percentage mark for all Sec 1E students (%)	65.2	67.1

Fig. 13: Mean percentage mark for students

The null hypothesis (H_0) is that DINE instructional strategy has no impact in improving students' understanding and construction of scientific explanations in content based scientific concepts. With regards to the test results listed in Fig. 13, the p value obtained for a one-tail t test is 0.027 ($p < 0.05$), and the null hypothesis can be rejected. Therefore, we can conclude that DINE has a significant impact on students' ability to construct scientific explanations.

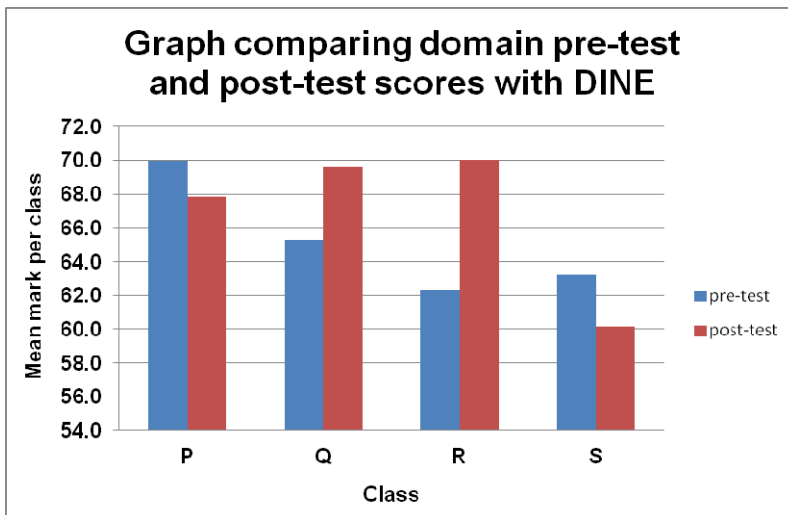


Fig. 14: Domain scores with DINE

Comparing the individual classes in Fig. 14 using a paired sample t-test as above (null hypothesis (H_0) is that DINE has no impact in improving students' construction of scientific explanations), the p values obtained and respective implications are collated in Fig. 15.

class	p value (one tail t-test)	significance
P	0.086 (>0.05)	H_0 is not rejected. DINE has no impact on how the students performed in their domain assessment tests.
Q	0.028 (<0.05)	H_0 is rejected. There is sufficient evidence at 5% level of significance to support the claim that DINE has a significant positive impact on students' results in domain assessment tasks.
R	2.59×10^{-05} (<0.05)	
S	0.033 (<0.03)	H_0 is rejected. DINE has a significant negative impact on students' results in domain assessment tasks.

Fig. 15: p values and implications

A possible explanation to qualitatively explain why DINE may not have a positive impact on Class S will be the English Language ability of the class. A comparison of the English Language

examination scores in the same time frame of this project showed that Class S had the lowest mean score amongst all four Express classes. The command of the English Language may have an important role to play in helping students understand what *Describe, Interpret* and *Evaluate* entails and the science concepts taught during the period. This would be in line with Jacob et al. (2013) who found that there was a correlation between proficiency in English language and academic performance of students in science and technical education.

On the other hand, as depicted in Fig. 14, Class P which performed the best in the DINE pre-test among the four Express Classes obtained a slightly lower overall mean for the DINE post-test. Our act of 'intentional reduction of complexity of experimental based questions' may have caused some students to lose their interest during the focal lessons. This offers the explanation on why the null hypothesis for Class P is not rejected.

Therefore, the results in Fig. 15 explicate two important facts - the weaker Class S needs pre-knowledge teaching and the stronger Class P needs a more complex zone of proximal development. Besides, the positive results offered by Fig. 13 and Fig. 15 as compared with Fig. 12 also explicate the fact that we need to apply three aspects collectively for our Scaffolding Strategy rather than merely adopt DINE instructional strategy alone.

In summary, our adopted Scaffolding Strategy requires the collective use of 'DINE', 'Bite-size Learning', and 'Focal Lesson'.

Action Research Cycle Eight: Justification for our Adopted Scaffolding Strategy

The justification for our collective use of 'DINE', 'Bite-size Learning', and 'Focal Lesson' can be explained using the notion of Connective Approach as described in the work of Strawson (1992), Tay (2003) and Tay et al (2010).

At the heart of the connective approach are the three distinct dimensions of ontology, epistemology and logic. Ontology is defined by Reber (1995) and Zuber-Skerritt (2001) as an aspect of

metaphysical inquiry concerned with the question of existence apart from specific objects and events. It is one's assumptions about the nature of being and reality. As pointed out by Nita (1999), ontology takes on two meanings. The first meaning takes reference to the real world, where experience is characterized in terms of what is 'out there'. The second meaning includes belief in the existence of the things in question such that these things are separated and related in time and space.

Epistemology is defined by Reber (1995) and Zuber-Skerritt (2001) as the branch of philosophy that is concerned with the origins, nature, methods and limits of human knowledge. It is our assumptions about the nature of knowledge and knowing. As pointed out by Nita (1999), epistemology is either something objective, to be accumulated independently of the perceptions of any particular observer or something subjective, a product created by the observer. In other words, epistemology is the use of concepts in judgement or belief. It refers to the personal and subjective phenomenon. The experience is characterized in terms of what is 'in the head' of humans.

In Strawson's (1992) view, logic is the study of the general forms of the proposition and of their relations of logical dependence and independence. It has no concern with the internal structure of uncompounded propositions that enter into its compounds. It has nothing to say about the content of logically simple propositions. According to Bench-Capon (1990), the main concern of logic is with the soundness and unsoundness of arguments. Its goal is to represent an argument in such a way that it will be uncontroversial as to whether that argument is acceptable or not.

In our adopted connective approach, the ontological dimension is represented by a particular Focal Lesson. The epistemological dimension is represented by the set of pre-requisite knowledge taught to students in class. The logic dimension refers to the DINE approach.

As pointed out by Tay (2003), the use of the three dimensions in our collective approach can be justified using the notions of generality, irreducibility and non-contingency.

Firstly, the three dimensions are general in nature. The 'Focal Lesson' is based on the general theory of being. It applies the notion of ontology by ensuring all its phenomena take reference to the real world. All the phenomena observed by students must be found in the physical setting associated with that Focal Lesson. The set of pre-requisite knowledge adopts the general theory of knowledge. It represents the collective body of information where students can use the underlying nouns, verbs, phrases or sentences to construct their concepts or explanations. DINE uses the general theory of proposition. It is concerned with what is true or false.

Secondly, all the three dimensions are irreducible. This is based on the fact that against judgements or beliefs derived from pre-requisite knowledge is the natural world or the physical setting associated with a respective Focal Lesson to which the judgements or beliefs relate. In order to determine whether the judgements or beliefs are true or false, the DINE approach is required by students to process the states gathered from the relations of judgements or beliefs derived from pre-requisite knowledge with that of the natural world associated with the Focal Lesson.

Thirdly, the three dimensions are non-contingent. Each element contains a distinct feature that is non-contingent. The Focal Lesson is concerned with things that are 'out there'. A pre-requisite knowledge is concerned with things that are 'in the heads' of humans. And the DINE approach is only concerned with the reasoning process. It interprets neither the content of the things in a Focal Lesson nor the concepts derived from pre-requisite knowledge.

Therefore, during the processing of applying our derived approach, the students traverse through an elaborate network of connected objects and concepts that enables students to construct an explanation concisely and comprehensively and also to be able

to interpret observed phenomena systemically and at higher level of complexity as witnessed from the results of this research study.

Action Research Cycle Nine: Reflections

The PAR process saw participation and co-construction from both students and teacher researchers. Students' feedback was used in refining Focal lesson 3 and they were given the autonomy to develop their own questions and experiments about the natural world in a bid to develop scientific explanations they are inherently interested in. Students also had autonomy to be 'teachers' to critique their peers' understanding of DINE strategy in Focal lesson 1. At the same time, students' opinions and artefacts helped teacher-researchers gain deeper understanding into the related processes in students' conceptions of ideas and come to a combined revelation that a teaching strategy (logic) alone cannot create understandings; instead, it requires an awareness of the educator to include understandings of students' epistemology and ontology.

While we have come to reveal the connected components of students' understandings, the next stage in our research would be to understand how these components develop extensively in socially constructed knowledge. Pintrich, Marx and Boyle (1993) contend that learners are affected by motivation, goals, beliefs and interests, so the ontology of scientific knowledge can be affected by social negotiations. Kelly et al. (2012) propose the view of epistemology as a social practice where ethnography and sociocultural norms can impact how learners participate in learning and meaning-making. Argumentation or logic in the learning sciences perspective can be influenced by shared norms of the culture-sharing group (Bricker and Bell, 2008). Group work and peer collaboration were present in all focal lessons - the understanding of the connective approach in this paper will serve as grounding for the study of developing scientific conceptions in social constructivist classrooms.

Conclusion

At the end of this research study, it became apparent that there are three factors that must converge to impact the development of a student's ability to construct scientific explanations and consequently, better understanding of scientific concepts. They are as follows:

1. DINE action strategy (Logic)
2. Domain knowledge through bite-size classroom teaching (Epistemology)
3. Focal lessons within ZPD (Ontology)

The relationship between the three factors can be represented in Fig. 16.

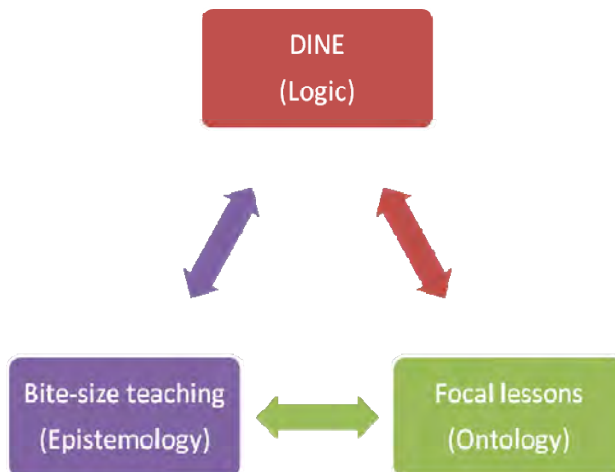


Fig. 16: Three factors that impact development of student's construction of scientific explanations

This participatory action research project has encouraged us to re-look at how we teach techniques to answer experimental based questions. Constructing scientific explanations gradually enhances students' ability to understand science concepts better (McNeill et

al, 2003). Statistical results through the measurement of domain pre-test and domain post-test scores have shown a significant improvement in student performance in two out of four classes. By trying this new initiative, it helps teachers realise the importance of building up essential skills in Lower Secondary to help students transit better into the rigorous Upper Secondary curriculum with an increased number of experimental based questions. Through this study, we also realised the value of scaffolding within the ZPD in assisting students to reach their potential level of problem solving capabilities.

More importantly, the PAR process has allowed us to realise the value of collaboration between participants, both students and teacher researchers, in tackling an issue. The respective reflections and co-construction of ideas between teachers and students after Focal lessons 1 and 2 led to the refinement of the intended Focal lesson 3, which increased engagement of students in science as observed. Students have expressed that DINE has been beneficial in their learning. Teachers' understanding on how to guide students in constructing scientific explanations has also been enhanced. PAR is a powerful way to improve teacher professional development. From this PAR project, our team hopes to continue to understand how the components of the connective approach function in tandem in social constructivist classrooms as learners learn in their unique contexts and epistemologies.

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Biography

Deborah Goh was the Section Head of Biology and Lower Secondary Science at Pasir Ris Secondary School, Singapore. She was a Professional Learning Team leader and collaborated with teachers to continually improve curriculum and pedagogy of science. Together with Zulaiha, she presented this paper at the International Society for the Systems Sciences conference (ISSS 2014) at Washington, D.C, U.S.A. Deborah is currently pursuing her graduate studies in science education at Teachers College, Columbia University.

Zulaiha Shireen is currently the School Staff Developer at Pasir Ris Secondary School, Singapore. She spearheads professional development programs for teachers to seek continuous improvement and growth in the teaching profession. Zulaiha also teaches Biology and Lower Secondary Science.

Appendix A



Pasir Ris Secondary School

Class Register Number

Name : _____

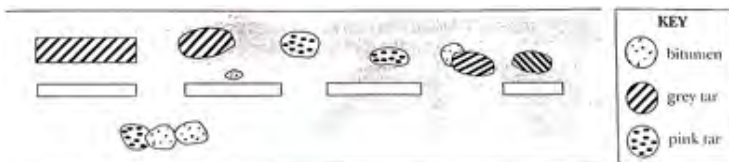
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SECONDARY 1 EXPRESS

LOWER SECONDARY SCIENCE

20 minutes

- 1 Holes in roads can be filled with different material. This road has been repaired more than once. In what order were the material used to repair the road?



- A grey tar, pink tar, bitumen
- B pink tar, bitumen, grey tar
- C bitumen, pink tar, grey tar
- D bitumen, grey tar, pink tar

2 This table contains some information about five planets.

planets	number of moons	surface	speed around the Sun (km/s)	distance from Sun (millions of km)
Mercury	0	solid	48	58
Earth	1	solid	30	150
Jupiter	15	gas	13	778
Neptune	6	gas	5	4496
Pluto	1	solid	5	5946

These tables show how Glen and Louise grouped these planets.

Glen Louise

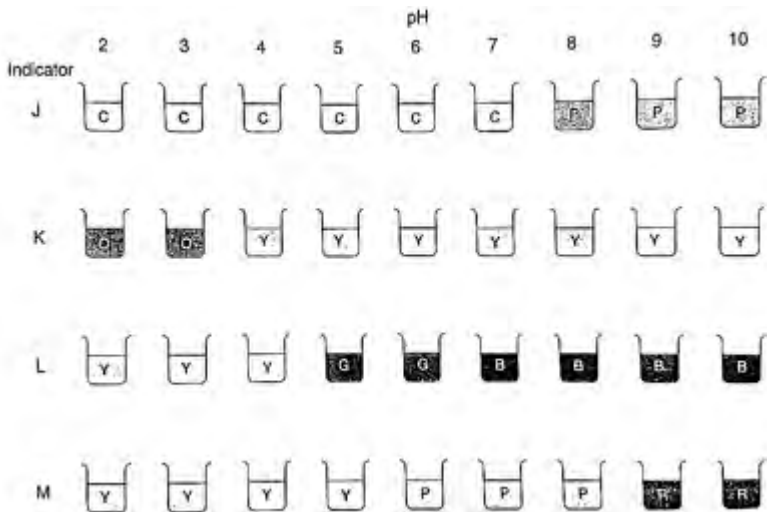
Group 1	Group 2
Mercury	Jupiter
Earth	Neptune
Pluto	

Group 1	Group 2
Mercury	Neptune
Earth	Pluto
Jupiter	

Which characteristics did Glenn and Louise use to group the planets?

	Glen	Louise
A	surface	distance from the Sun
B	speed around the Sun	distance from the Sun
C	surface	number of moons
D	speed around the Sun	number of moons

3. Indicators change colour depending on the pH (acidity) of the liquid.
 The colours of some indicators are shown on part of the pH scale below.

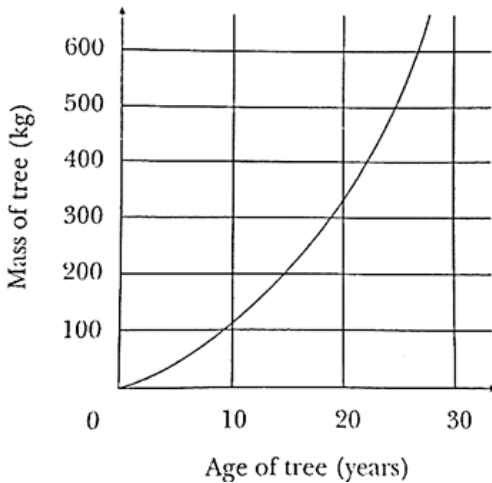


KEY		
C = colourless	O = orange	R = red
B = blue	P = pink	Y = yellow
G = green		

Nina has a solution with a pH of 5. Which indicator(s) should she use to show this?

- A J only
- B L only
- C K and L
- D L and M

4. This graph shows how the mass of a tree changed with time

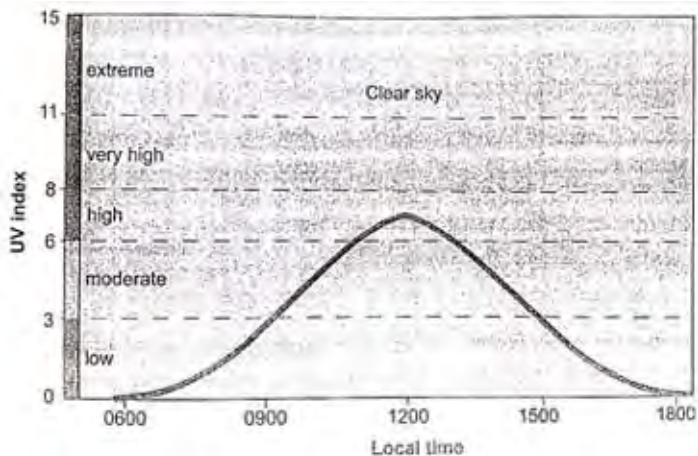


The mass of this tree approximately doubled from age 5 years to 9 years. Approximately how much longer did it take to double its mass again?

- A 5 years
 - B 10 years
 - C 15 years
 - D 20 years
-

5. The UV Index provides a daily forecast of the expected ultraviolet (UV) radiation from the Sun. Overexposure to the Sun's UV radiation causes skin damage.

The graph shows the relationship between the UV Index and local time on a certain day.



The table shows the length of exposure to UV radiation after which people of two different skin types are at risk of skin damage.





UV index value	minimum time to skin damage (minutes)	
	skin type – never tans	skin type – never burns
0 – 2	30	120
3	20	90
4	15	75
5	12	60
6	10	50
7	8.5	40
8	7.5	35
9	7	33
10	6	30
11	5.5	27
12	4	21

How long could a person with skin that never tans remain in the sun at midday on this day before sustaining skin damage?

- A 7 minutes
- B 7.5 minutes
- C 8.5 minutes
- D 40 minutes

6. The graphs below show the proportions of carbohydrates, proteins, fats and water in some foods.

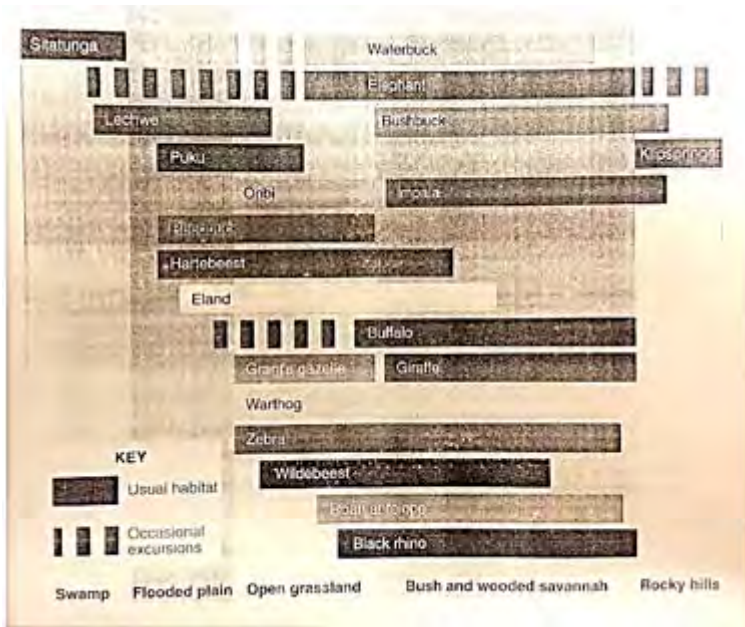


KEY	
	carbohydrates
	proteins
	fats
	water

Approximately how much rice contains the same amount of water as 400g of beans?

- A 100 g
- B 200 g
- C 600 g
- D 1000 g

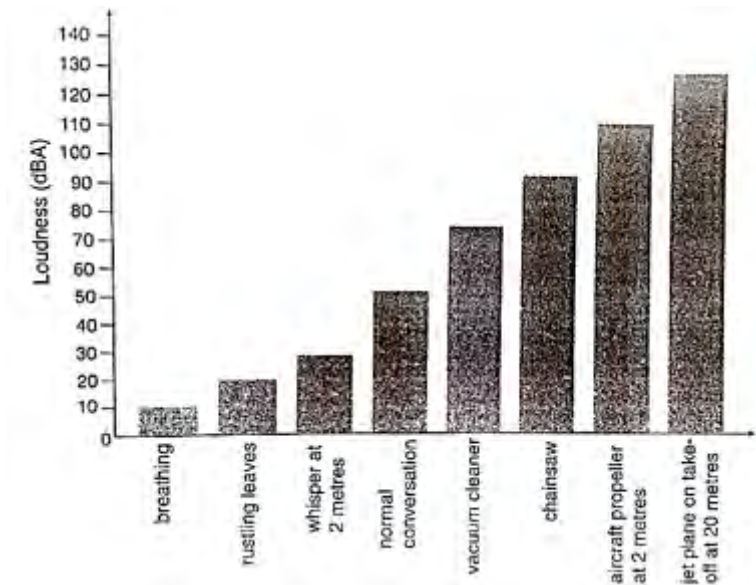
7. The chart shows the distribution of some plant-eating mammals in Africa.



Elephants and buffalos have excursions outside their normal distribution. Which of the following is not a likely reason for this?

- A avoiding competition for space with Sitatungas
- B avoiding competition for space with Roan antelopes
- C looking for plants to eat
- D looking for water to drink

8. The loudness of a sound was measured in decibels (dB). Humans can detect sounds of 0 dB or louder. This graph shows how loud some sounds are.



A wall is covered with material that reduces sound passing through it by about 90 dB. A sound is produced on one side of the wall and can barely be heard on the other side.

Which of the following probably produced this sound?

- A normal conversation
- B vacuum cleaner
- C chainsaw
- D jet on takeoff

9. The table summarises the success or failure of reintroducing Australian native mammals into the wild.

species	result of reintroduction	threats
brush-tailed possum	failure	feral cats, foxes
eastern-barred bandicoot	success	Foxes, feral dogs
queensland ringtail	failure	feral cats, feral dogs, foxes
southern hairy-nosed wombat	success	human settlement, sheep
stick-nest rat	success	exotic plants, sheep
Western quoll	failure	feral cats, feral dogs, human hunters, wild pigs

Based on the table, what is the most serious threat to the reintroduction of native mammals into the wild?

- A feral cats
- B feral dogs
- C foxes
- D humans or human settlement

10. An adult's Body Mass Index (BMI) can be used as a guide to determine the healthy weight-range for a particular height.

The following table gives the BMI values and weight categories for a range of heights and masses.

	height				
	1.5 m	1.6 m	1.7 m	1.8 m	1.9 m
50 kg	22.2	19.5	17.3	15.5	13.9
55 kg	24.4	21.5	19.0	17.0	15.2
60 kg	26.7	23.4	20.8	18.5	16.6
65 kg	28.9	25.4	22.5	20.1	18.0
70 kg	31.1	27.3	24.2	21.6	19.4
75 kg	33.3	29.3	26.0	23.1	20.8
80 kg	35.6	31.3	27.7	24.7	22.2
85 kg	37.8	33.2	29.4	26.2	23.5
90 kg	40.0	35.2	31.1	27.8	24.9
95 kg	42.2	37.1	32.9	29.3	26.3
100 kg	44.4	39.1	34.6	30.9	27.7

KEY	
underweight	
acceptable	
overweight	
obese	

According to the table, a 1.7 m tall adult with a mass of 90 kg is considered obese.

What is the minimum mass this person needs to lose to reach an acceptable weight-category?

- A 6.9 kg
- B 20.0 kg
- C 24.2 kg
- D 31.1 kg

Appendix B

Identification of daily exercise questions from theory workbook and practical book for incorporation of DINE instructional strategy in construction of scientific explanation

Timeline	Topics (Bio + SSM)	Theory Work Book		Practical Book	
		Analytical	Observation/ Inference	Analytical	Observation / Inference
T2 W1 - T2 W3	Chapter 10 Transport System in Organisms	B/p1/q2, B/p2/q4, B/p8/q5a,5 b,5c	B/p4/q1a,1b,1c, 1d,1e, B/p7/q4a,4b	B/p6/q1-2,	-
	Chapter 7 Particulate Model of Matter	A/p81/q2	A/p75/q2, A/p76/q4, A/p77/q5, A/p78/q1-3, A/p80/q5, A/p83/q4-6, A/p85/q2, A/p86/q5	-	A/p79/q1-3 (optional)
T2 W4 - T3 W2	Chapter 11 Human Digestive System	-	B/p9/q1-3, B/p10/q6-7, B/p11/q10-13, B/p12/q14-16, B/p13/q18 B/p15/q1,3,5,6, 7,8	-	B/p11/q1
	Graph drawing and analysis (Pie/ Bar/ Line)	Analytical: T1W2 Graph Drawing and Analysis worksheet. Plotting lines graphs and drawing line of best fit.		Observation/Inference: T2W4 Ecogarden Activity worksheet : (1) Tally sheet on number of different flowers or individual plants in Ecogarden (2) Drawing bar chart and pie chart from data in point (1) T3W1 Variables worksheet : Identifying the dependent, independent and control variables given different experiments.	

Appendix C

Determining suitable questions for pre-test and post-test

Question Type	Year	Question Numbers	Shortlisted Questions (X2)	FINAL questions	Remarks
Observation/ Inference (X3)	2000	1, 3, 4, 5, 6, 9, 12, 13, 14, 15, 16, 17, 18, 22, 23, 26, 27, 28, 36, 37, 38, 39, 40, 41, 42	28 & 42	11 (2001) 20 (2000) 28 (2000)	11 (2001) Suitable 27 (2000) Too simple? Suggest to replace with Qn 42 (2000) or 20 (2000) 28 (2000) Suitable
	2001	4, 5, 6, 7, 9, 11, 13, 14, 15, 18, 19, 20, 21, 22, 24, 25, 26, 29, 32, 33, 34, 35, 38, 44, 45	11 & 19		
	2002	14, 15, 22, 29, 35, 36	22, 36		
	2003	28, 30, 39			
	2007	1, 2, 3, 4, 5, 9, 10, 28, 29, 30, 31, 38, 39	28 & 29		
Line Graph (X2)	2000	33 & 34	33 & 34	3 (2001) 15 (2007)	3 (2001) Suitable 15 (2007) Suitable
	2001	3, 23, 31, 36, 37,	3 & 37		
	2002	none	none		
	2003	none	none		
	2007	12, 15, 16	15		
Pie Chart (X1)	2000	43	43	43 (2000)	43 (2000) Suitable
	2001	none	none		
	2002	none	none		
	2003	none	none		
	2007	none	none		

Question Type	Year	Question Numbers	Shortlisted Questions (X2)	FINAL questions	Remarks
Bar Chart (X2)	2000	7 & 25	7 & 25	11 (2003) 25 (2000)	11 (2003) Suitable 25 (2000) Suitable
	2001	12,	12		
	2002	13, 26	13, 26		
	2003	7 & 11	7 & 11		
	2007	6, 22,	6, 22,		
Table (X2)	2000	2, 10, 11, 19, 20, 21,	20 & 21	28 (2002) 20 (2003)	28 (2002) Suitable 20 (2003) Suitable
	2001	1, 2, 8, 10, 27, 28, 40, 43	8 & 27		
	2002	8, 28, 33, 34, 36	28,34, 36		
	2003	20, 24	20, 24		
	2007	11 & 15	11 & 15		

Appendix D

**Pasir Ris Secondary School
Lower Secondary Science
Secondary One Express**

Name: _____ () Date: _____

Class: 1E _____

Time: 1 hour

Osmosis in Plant Tissue

Objective: In this experiment you will learn how to:

- set up an experiment to demonstrate osmosis in plant tissue.
- measure changes in length to an appropriate degree of precision.
- record and present your data in the form of tables and graphs.
- explain the results of your experiment
- draw conclusions from the results of you experiment

Aim: To set up an experiment using plant tissue to observe osmosis.

Apparatus: Petri dish (2) ruler
Sharp scalpel stopwatch

Materials: 0.5%, 1%, 5%, 10%, 20% sucrose solution (sufficient to completely cover the potato strips in the petri dishes)
distilled water
half a freshly cut potato (preferably placed in a plastic bag to prevent drying)

Procedure:

1. Remove the skin of a potato. Cut the potato into 6.0 cm long strips with a cross section of 0.5 x 0.5 cm.

Note: The ruler can make measurement of lengths with an accuracy of 0.1 cm

2. Place one strip of potato in each of the given sucrose solutions and one strip in distilled water.

Note: Ensure that the potato strips are completely submerged by the solutions.

3. After 20 minutes, remove each strip and measure its length.

Note: Blot the potato strips dry before taking any measurement.

4. Record the measurements and note down the texture and appearance of each strip in the table below.

Note: The example shows how data should be presented in a table. Note that the units of measurement are always stated in the header row and never in the body of the table.

	Initial length/cm	Final length/cm	Difference in length/cm [state increase (+) or decrease (-) in length]	Texture and appearance
Strip in water	6.0			
Strip in 20% sucrose solution	6.0			
Strip in 10% sucrose solution				
Strip in 5% sucrose solution				
Strip in 1% sucrose solution				
Strip in 0.5% sucrose solution				

5. Explain your results with reference to the cells in the potato strips.
 - a) Potato strip in water:
 - b) Potato strip in sucrose solution:
 6. On the graph paper provided, plot a graph of difference in length of potato strip against concentration of glucose solution, using the results in your table obtained in step 4.
 7.
 - a) Using the graph, deduce the water potential of the potato tissue.
- b) Explain how you deduced the water potential of the potato tissue.

Appendix E

Sample of Group A work and corresponding students' critiques

D:Potato strip in distilled water is slightly bigger in size.	Agree. The potato strip does increase in size in distilled water.
IN:Potato strip absorb the water.	I agree, but you need to explain more, like how osmosis work in the absorption of the water by the potato strip. you also need to explain the <u>higher potential and lower potential</u>
	I agree. However, for Interpret, your explanation could be improved by briefly saying that the water molecules have moved from the distilled water and into the potato strip.
E: Osmosis has taken place. The water molecules move from a region of higher concentration to a region of lower concentration.	I agree with what they said. The water molecules moved from a higher region of concentration to a lower region of concentration thus, changing the length of the potato strip

Sample of Group B work and corresponding students' critiques

D:The potato strip increased in length.	Disagree, although all three statements are correct, the whole explanation does not make sense. In the 'E' column, how did the process of osmosis cause the potato strip to increase in length? The group only provided the definition of osmosis and even the explanation is incomplete (what does the water molecules pass through?). They also did not explain how the process relates to the potato strip's increase in length. The arrangement of the statements is probably the fault in the explanation. I suggest that the statement in the column 'IN' should be placed in the 'E' column while the definition of osmosis should be placed in the "IN" column instead. The cause of the increase of the potato strip's length (osmosis) should also be placed in the 'IN' column before the definition of osmosis.
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<p>IN: The water molecules has moved from the water which has higher water potential to the potato which has lower potential of water molecules through osmosis through the partially permeable membrane.</p>	<p>You should be more specific and state it as “potato strip” instead of potato as there’s a difference between a whole potato and just a strip.</p> <p>Agree. What had happened, what the cause was and what the scientific explanation is had all been answered thoroughly. The process of osmosis is also accurately explained.</p>
<p>E: Osmosis is the movement of water molecules from a region of higher water potential to a region of lower water potential. Thus, the potato strip increased in length</p>	

Sample of Group C and corresponding students’ critique

<p>D: The potato strip in the water is rough and hard. It increases in length.</p>	<p>Disagree. they should mention that the water molecules move through a partially-permeable membrane for the definition of osmosis.</p>
<p>IN: The water molecules move from the water which has a higher water potential to a region of lower water potential which is the potato strip.</p>	<p>Disagree. The definition is not written so we do not understand what it mean by moving from the water solution to the potato strip</p> <p>Disagree. The definition is incomplete, they should have mentioned ‘osmosis’ in their answer as it is a key word and they should have also included that the water molecules were moving through a partially permeable membrane. (The potato strip) From a region of higher concentration to a region of lower concentration.</p>
<p>E: This process is known as osmosis. Osmosis is the process where water molecules move from a region of higher water molecules to a region of lower molecules.</p>	<p>Agree. The water from the potato decreased</p>

Sample of Group D and corresponding students’ critique

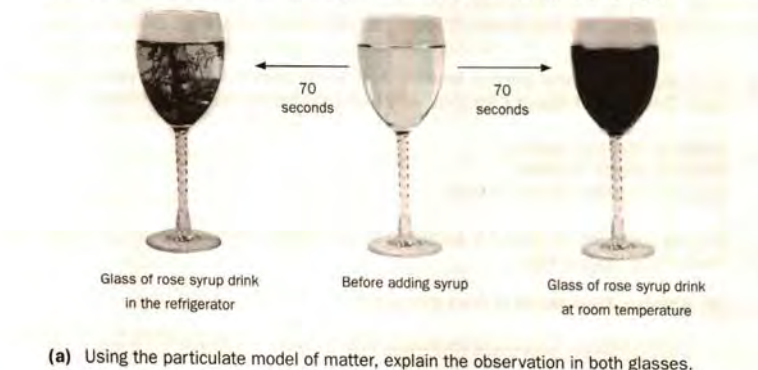
<p>D: the potato strip became softer and and smoother</p>	<p>I agree that the process is diffusion. It is because the potato strip became softer, thus the particles moved out of the potato strip by the process of diffusion.</p>
---	---

IN: The sugar in the 20% sucrose solution (a region of higher concentration) has moved from the potato strip into the solution (region of lower concentration).	
E: This process is called diffusion ☺	I agree. The potato strip took in sucrose and became softer and smoother.

Appendix F

Focal lesson for Science Skill module

5. Sook Mei wanted to prepare two glasses of chilled rose syrup drinks. She placed equal amounts of concentrated rose syrup in the glasses of water. She was carefully transferring the first glass to the refrigerator when her mother asked her to run an urgent errand. As she had not stirred the drinks, the following was what she observed some time later.



Teacher explanation of how DINE is used in this workbook exercise question

Describe(What do you see?):

After 70s the rose syrup in the refrigerator has not spread out evenly in the water but the rose syrup at higher temp has spread out evenly.

Interpret (By what manner did it happen?) : The rose syrup particles in the glass spreads faster at room temperature than in the refrigerator.

Evaluate (How is it related to theory/scientific concepts?)

- The **particles of water** are **constantly moving**.
- When the rose syrup is added to the glass of water, the **water particles collide with the syrup particles**.
- At **higher temperature**, the **water particles move faster and collide more frequently** with the rose syrup particles.
- At lower temperatures, the **water particles move slower and collide less frequently** with the rose syrup particles.

Appendix G

Pasir Ris Secondary School

Science Department Lesson Plan

Topic: Science Process Skills
Subtopic: Hypothesis Formulation and Data Analysis (DINE)
Lesson Objectives (Knowledge, Skills, Attitudes): At the end of the lesson, students would be able to: <ol style="list-style-type: none">1) Learn how to formulate hypotheses from their everyday observations.2) Learn how to plan a simple experiment to determine the validity of their hypothesis3) Interpret and analyse the data presented to them via the DINE method Attitude: <ol style="list-style-type: none">1) To impart a sense of curiosity and wonderment on the world of science2) More cooperative and willingness to learn from fellow classmates during group work
Prior Knowledge: <i>A) Students have been taught:</i> <ol style="list-style-type: none">1) Analysis of different forms of data2) DINE method of interpreting and answering data-based questions (DBQs) <i>B) Misconceptions or difficulties that students may have:</i> <ol style="list-style-type: none">1) Questions are hypotheses2) Difficulty in formulating coherent observations3) Visualising an experiment to test hypothesis4) Answering questions based on the data given

Area of Focus (eg. Assessment, Pedagogy):			
Development of Science Process Skills through DINE method			
Duration	*Learning Activities / Strategies	**Rationale	Resources
INTRODUCTION			
10 mins	Intro to activity at Ecogarden and breaking up into groups	Understand the scope and requirements of activity	N.A.
DEVELOPMENT			
15 mins	Observation and visit to Ecogarden	Students to observe and raise questions about their surroundings	Activity Worksheet
15 mins	Discussion on hypothesis and visualise experiment	Students appreciate the process of experimentation better	N.A.
5 mins	Disseminate data and questions for the students' "experiments"	N.A.	Data and Question Worksheets
20 mins	Group discussion to apply DINE for interpretation and answering questions based on given data	Application of DINE to solve DBQs	N.A.
CONCLUSION			
10 mins	Going through the answers and correction of major errors	Correct misconceptions students may have	Visualiser
5 mins	Post Lesson Survey	To gauge the students understanding and lessons learnt	N.A.

Appendix H

Pasir Ris Secondary School

Science Department Lesson Plan

Topic: Science Process Skills
Subtopic: Hypothesis Formulation and Data Analysis (DINE)
Lesson Objectives (Knowledge, Skills, Attitudes): At the end of the lesson, students would be able to: <ol style="list-style-type: none">1) Interpret and analyse the data presented to them via the DINE method2) Recall the basic scientific thinking process Attitude: <ol style="list-style-type: none">1) Students are to contribute actively to the discussion2) More cooperative and willingness to learn from fellow classmates during group work
Key Inquiry Questions: <ol style="list-style-type: none">1) What can you see from the data? (Describe) - Highest/lowest values? - Any obvious trends that you observe?2) What do the trends and anomalous results indicate? (Interpret)3) What can you conclude from the results? What does that mean for your hypothesis? (Evaluate)
Prior Knowledge: <i>A) Students have been taught:</i> <ol style="list-style-type: none">1) Analysis of different forms of data2) DINE method of interpreting and answering data-based questions (DBQs)3) Visualising and planning of experiment to test hypothesis

B) <i>Misconceptions or difficulties that students may have:</i>			
1) Difference between interpretation and description of data			
2) Drawing appropriate conclusions from the data pertaining to their experiment			
Area of Focus (eg. Assessment, Pedagogy):			
Development of Science Process Skills through DINE method			
Duration	*Learning Activities / Strategies	**Rationale	Resources
INTRODUCTION			
5 mins	Briefing on task for the lesson/Recap of previous lesson and DINE	Students will recall what they have done previously and will be able to apply to this lesson	Visualiser
DEVELOPMENT			
5 mins	Disseminate data and questions for the students' "experiments"	N.A.	Data and Question Worksheets
20 mins	Group discussion to apply DINE for interpretation and answering questions based on given data	Application of DINE to solve DBQs	N.A.
CONCLUSION			
5 mins	Going through the answers and correction of major errors/Summarise the entire scientific process and DINE method	Correct misconceptions students may have	Visualiser
5 mins	Post Mortem Survey	To gauge the students understanding and lessons learnt	N.A.

Appendix I

Secondary One Express Science Process Skills

Ecogarden Data Base Questions Activity ONE

Group Name: _____ Class: _____

Group Members: _____

1) Start by observing things around you in the Ecogarden. If you are curious about any organism in the Ecogarden based on your observations, write it down below:

(e.g. why are the flowers of Ixora brightly coloured?)

2) Next, pick one of the most relevant observation that you are curious about, and formulate a hypothesis based on it. Remember, hypothesis isn't a question but a statement!

(e.g. The flowers are brightly coloured so as to attract birds and bees to pollinate it)

My hypothesis is that

3) Design a simple experiment to test out your hypothesis. Include what type of data you will be collecting.

Appendix J

Secondary One Express Science Process Skills

Ecogarden Data Base Questions Activity TWO

Group Name: _____ Class: _____

Group Members: _____

You are now provided with a set of data pertaining to your designed experiment. Answer the following questions based on this set of data.

1 a) What are the highest and lowest readings? (Describe)

b) What do these readings signify? (Interpret)

c) Is the trend of the data increasing, decreasing or constant and what does it mean? (Interpret)

2) Give a conclusion to your hypothesis, stating whether it was possibly true or possibly false, and why. (Evaluate)

Developing environmental citizenship on campus through Action Research

Noa Avriel-Avni

Abstract

This study was designed to refine the understanding of how environmental education influences the development of thought processes, moral awareness and students' ability to act as environmental citizens. The findings are based on content analysis of students' reflections on leading environmental change through ecological-thinking based action research. Generally, students' self-perceptions refocused from dichotomy between activism and academia and between self and the world to a more holistic perception joining theory to action. Reflections indicated the development of a sense of capability, and of command over dimensions of time, interaction with peers and action-required information. The article offers a wealth of insights into the teaching of environmental citizenship in academia, concerning both students and lecturer.

It demonstrates the potential, inherent in ecological thinking, for developing an effective curriculum for teaching environmental citizenship in academia. And it suggests action research as an effective approach to integrating academy and activism.

Keywords:

Environmental citizenship; ecological thinking; higher education; activism; Action Research; sustainability

Introduction

In 2010, I was asked by Ben Gurion University in Israel to form a course in Sustainability. Sustainability refers to the ability of social-

ecological systems to maintain the wellbeing of their residents in the long term (Daw, Brown, Rosendo and Pomeroy, 2012). It includes social, economic and environmental aspects (UNESCO, 1992). Education for sustainability deals with developing a socio-environmental approach that emphasizes caring, cooperation and concern to the community and the environment, present and future (UNESCO, 2005).

The extensive theoretical knowledge on this subject I had accumulated hitherto had apparently qualified me to present it to students. In line with academic practice, I was requested to base my instruction on both theory and the critical examination of research.

I felt that I wanted to employ my professional and academic training and knowledge at their best. I perceived as irrelevant my identity as an environmental activist, even as an interference with academic professionalism. Academia may fulfill a vital role in sustainability education (Stephens et al., 2008). However, the focus on specialization, the struggle toward objectivity, the culture of scientific circumspection, and avoidance of interdisciplinary dilemmas - all prevalent in academia - are liable to paralyze actions promoting sustainability (Horhota et al., 2014). On the other hand, sustainability education which does not strive to develop active environmental citizenship will neglect its principal purpose (Dobson, 2003; Smyth, 2006; Littleldyke, Manolas, and Littleldyke, 2013). The 'activist within me' riled against this apparent dichotomy between theory and action.

I decided to overcome this duality by basing instruction of the course on the action research approach - as a world view as well as a research tool that is in accord with action for change. I named the course "From ecological thinking to environmental citizenship". In it, students experienced active environmental citizenship (EC) and simultaneously investigated the field in which they were acting and the changes they effected. This following study focuses on the benefits inherent in the use of action research as a theoretical and practical framework for educating toward EC.

Citizenship means active participation in the community and the State, out of responsibility to, and solidarity with, others (Barry, 2006). The active citizen has a tendency for cooperation with others, and even leadership, out of awareness of cultural diversity and variance of values. Civic action is defined as a pro-active approach of individuals or groups in the public arena for the accomplishment of common goals (Chawla and Cushing, 2007). Similarly, the term "environmental citizenship" means self-perception as an integral part of the environment and a willingness to take action to render it sustainable (Dobson, 2003). The nature of environmental dilemmas, which often transcends national borders, is such that it defines environmental citizenship as global citizenship – rather than citizenship a particular state (Dobson, 2003; Berkowitz, Ford and Brewer, 2005). The environmental citizen remains committed to the basic tenets of Liberalism (especially freedom of the individual) together with an active participation (Republican in nature) in civic-environmental matters (Barry, 2006). People's mental habits, positions and concerns are transformed into a citizenship pattern that constantly works for the greater good of the entire social-ecological system (Gutiérrez-Pérez and Poza-Vilches, 2012). The social-ecological dilemmas facing environmental citizens are in their very essence and nature complex, spanning several disciplines of knowledge; therefore, they need to be tackled by multidisciplinary work-groups. In addition, the dynamic nature of the social and ecological environment includes a significant factor of incertitude, in which the environmental activist is compelled to navigate (Posch and Steiner, 2006; Tidball and Krasny, 2011). According to the model expounded by Berkowitz, Ford and Brewer (2005), active EC rests upon two types of literacy and two forms of self-perception. The term "literacy" here means the ability to use various language functions, in different contexts and in accordance with changing circumstances. It is built on knowledge relating to a particular content area ([Merriam-Webster Dictionary](#)). '*Ecological literacy*' comprises an understanding and knowledge of the manner in which ecological systems that support human existence are created and function; '*social literacy*' means the understanding of working

social systems; '*awareness of values*' is an additional element of EC that guides the individual when choosing a course of action. It is based on '*empathy*' for the concerns of '*others*' in the system. The fourth vital element of EC is a '*sense of competence*' – feeling able to bring about change.

The need to address the ethical and political dimensions of environmental dilemmas dictates subjective action; the actions of an environmental activist, therefore, reflect a personal attitude, attendant with ethical or emotional commitment (Hale, 2008; Flood, Martin and Dreher, 2013). Keiny (2004) has called this perception of self and of the individual's relationship with the environment '*ecological thinking*' (ET). ET, which incorporates views characteristic to ecology and to theories of system thinking and self-organizing systems, was defined by Keiny as holistic, reflective and having an ethical dimension (ibid. page 198). An understanding of education toward EC in this manner will focus efforts on transformative learning (Moore, 2005). Forming new concepts – even when done in a constructivist way – is not sufficient; students' frame of reference must also be upset (Kegan, 2009). Then the structure of assumptions which we use to understand our experiences and which selectively fashions and delimits our expectations, emotions and consciousness of people and phenomena can be remodeled. These very assumptions determine our course of action (Mezirow, 1997).

Active EC is rooted in a world-view similar to that of the Participatory Action Research (PAR) approach (Gutiérrez-Pérez and Poza-Vilches, 2012; Duenkel and Pratt, 2013; Avriel-Avni, 2006). Moreover, the flexibility of PAR makes it appropriate for conducting social change in our current turbulent world (Bawden, 2012; Zuber-Skerritt, 2012). Therefore, this approach is suitable to teaching a course in sustainability aiming to cultivate sustainable behavior. Action research based on the involvement of the individual, or group, with the system, in order to transform the behavior (and sometimes even the self-perception) of the activists/researchers themselves, transforms the system in which they are active. Continuous reflection accompanies this process by

participants on their actions and by a constant dialogue with the ever-changing environment (McNiff, 2013). Kurt Lewin (1948), the father of 'field theory' and the 'action research' approach, argued that deliberate action must place the particular case in the larger picture of processes occurring on extended scales of time and space. An analysis of the equation of forces and the identification of the acting individual's place within it are vital – according to Lewin's argument – to molding effective action. In a manner similar to the 'environmental citizenship' approach, 'action research' also conceives of the acting individual as part of the social-ecological fabric. Each behavioral adjustment by the acting individual influences the participants in the social situation and the ecological system of which the activist is a part; hence the individual is capable of affecting the ecological system and improving it through deliberate action (Avriel-Avni, 2006). Such research carries risks, inherent in the inability to predict results and in the possibility that participants' transformation will engender tension between them and the system (Bawden, 2012; McNiff, 2013). For this reason, action must be accompanied by constant learning and by adjustment of behavior to changes occurring in the system (Tidball and Krasny, 2011). Gutiérrez-Pérez and Poza-Vilches (2012) have pointed out the great similarity between the principles of action research and the Guidelines to the participation of local government in sustainable development (UNESCO, 1992). In other words, the principles of action guiding the environmental citizen and the conduct of action research are similar in both practice and world-view.

The development of knowledge and the conduct of social change are characteristic of action research. These satisfy the desire to act as environmental citizens and to participate in leading a sustainable democratic society, as well as the natural expectation from academic lecturers to be grounded in existing research (Hutson, 2013; Posch and Steiner, 2006). Moreover, action research can be employed as a teaching strategy that empowers students and nurtures in them critical and reflective thinking, which is so vital to conducting social-environmental change (Stapp, Wals, and

Stankorb, 1996; Duenkel and Pratt, 2013; Flood, Martin and Dreher, 2013).

In accord with the basic principle of action research, self-reflection by the activist-researcher is a central constituent in the conduct of environmental activism. Through it, the actor observes the method of action he/she has chosen to employ, and its influence on the system he/she attempts to change (McNiff, 2013).

Self-reflective writing about experiences makes it possible to intensify and conceptualize learning; to discover hidden aspects of a situation and the role of an activist-researcher in it; and to develop critical thinking (Rogers, 2001) indispensable for transformative learning (Mezirow, 1997). In the present study, the reflections of students on their experiences in action research served as the principal means to discover the dilemmas attending environmental action, the changes in perception of the social and bio-physical environment, and the changes in perception of 'self' as capable of acting and initiating change. These reflections served also to understand the influence of action research methodology on all these.

Methodology

This study is based on data collected over three years of teaching in an academic institution in Israel. The course ("From Ecological Thinking to Environmental Citizenship") was part of general studies, in the framework of "Green Campus", and was open to all students in the Humanities and Social Studies Faculty.

Most students participated as part of studies toward a Bachelor of Arts degree, in the second or third year. The class was diverse and included students majoring in Geography, Education, Economics, Political Science and Behavioral Sciences. Students were in their twenties; most had not yet started a family.

The course title indicated the aspiration to make theory and knowledge the basis for action. On the theoretical level, students were exposed to concepts from the science of ecology and to the concept of 'ecological thinking' as a prism for examination of the

world and as a new frame of reference for the environment. The theory and practice of 'action research' were taught with the objective of making environmental activism reasoned – i.e., based on knowledge and systematic, reflective thinking. Following initial exposure to theory, students were required to conduct limited action research relating to any social-environmental unease they were experiencing in the system wherein they were living and acting. Studies conducted by students had, for example, the following subjects:

- Organizing residents of an underprivileged neighborhood to establish a composting center
- Improving employment conditions of campus cleaning staff
- Organizing the teaching staff to contribute to the improvement of the school's recycling schemes
- Starting a community garden next to the building in which I live.

Students' research activity started at the end of the first third of the course. First, they were required to present the subject of their study to the class and to justify their choice (in terms of the dissonance between their value-system or sustainability principles and their discontent with prevailing norms in their immediate surroundings). Next, they were asked to perform a preliminary study enabling them to describe their social-ecological surroundings as a system; to place their selves in that system, and to identify the strategies they would use to affect change in it. They were also directed to choose or design research tools that would enable them to assess the degree of change in the system resulting from their action. The outcome of this action research was presented at the end of the course to elicit feedback from their peers and was ultimately submitted as a final paper. The last class of the course was a reflection, in which students were requested to offer perceptions of themselves as environmental citizens and to describe what they had learnt about education toward environmental citizenship from their experience. These personal

and conceptual insights were also included in the final paper. It, therefore, comprised two reflective chapters:

- Self-reflection: what have I learnt about myself as an environmental activist?
- Reflection of the second degree: what can be learnt from my experience, and from that of my peers, about education toward environmental citizenship?

During the three years in which the course was held, 90 personal reflections – about 30 each year – were collected. These reflections constituted the bulk of study data. Descriptions of action research from the final papers constitute additional data contributing to this study.

The study was designed according to phenomenographic research approach (Marton, 1981). Phenomenography examines how people experience, understand, and ascribe meaning to a specific situation or phenomenon (Marton and Booth, 1997). Experiencing a phenomenon means observing it against the background of its context, categorizing it, giving meaning to its properties distinct of other possible properties, and observing its complexity and the interactions between its components. When a person experiences a phenomenon, he or she actually highlights certain aspects of this phenomenon, while ignoring other aspects or treating them as background. The different ways people experience the same reality may be critical when they face learning challenges (Marton, 1981). Accordingly, the unit of the phenomenographic research is *a way of experiencing something*, and the aim of the research is to expose and describe the variations in the way a certain phenomenon is experienced. The various ways of experiencing the phenomenon and the nature of the relations between them signify "the outcome space" (Marton and Booth, 1997, 125). The phenomenographic approach used in this study was based on content analysis and categorization (Wetherell et al., 2001) of all the students' reflections; it served to build grounded theory (Glaser and Strauss, 2009) of the "outcome space" of students' conceptions of their environment and their place in it.

Analysis and interpretation of this kind cannot but also reflect the teacher-researcher's own inner world. Therefore, analysis of data alternated between interpretation of students' reflections and interpretation of my own conduct as class lecturer (as was noted in my researcher logbook). This process was conducted with an awareness of the ethical limitations placed on a researcher involved in a study and the need to maintain its scientific integrity (Bryman, 2012).

I thus learnt from analysis an important lesson about myself as teacher and advisor. These insights are presented at the conclusion of each paragraph describing the findings.

Findings

Content analysis of reflections of 90 students elicited an abundance of insights into the essence of the experience of activism in an academic framework. Integration of the categories that emerged from reflections analysis (emic) with the categories derived from the theory of environmental citizenship (etic) made it possible to define three general categories organized in a rising scale of ecological thinking. The general categories were formulated in a process that moves from the personal level to the general level (Marton and Booth, 1997). However, applying a general category to an individual is not obvious, since an individual student will usually hold a dynamic amalgam of all three.

It would be presumptuous to claim a profound or paradigmatic change of students' conceptual framework after a course of one semester, but some of the instances display the beginnings of one, and I shall endeavor to demonstrate this in the findings.

First category: I and the world

In this category, the environment is perceived as a distinct entity despite the fact that the connection between man and environment is well known as a theory. This category is characterized by awareness of personal values, but the self is perceived to be separate from the world. One of the features of this category is a

clash between personal values and reality. It emerged that for students this was a common experience:

"The removal of the bottle collection cage away from the garbage collection area bothered me a lot. I felt I had to make inquiries with the authorities responsible, in order to elicit answers".

"The subject of waste, sorting it, recycling it and reducing it occupies me a lot lately. Once I had been 'a superb consumer', as my husband would describe me: I would buy to have and of course if the item was on sale. With time I have started more and more to buy only what I need. I also have become a conscious consumer".

In some cases students indicated that the knowledge to which they were exposed at the university was the cause of discontent with the surroundings:

"Study in the Geography department and exposure to various courses about the environment provided me with concepts, knowledge and perspective about the importance of the domain of environment".

And the surroundings were experienced as ominous and requiring action:

"...the use of plastic bags... [is] conceptual disruption... because bags are an indicator and a symbol of the 'use and discard' society and are just one expression of our use of disposable products in all domains of life, which contributes to waste of environmental and natural resources".

However, according to students, a prevailing sense of lacking control over time prevented action:

"I admit that until I received the course assignment I did not act on this subject, due to lack of free time".

"It is hard or impossible to accomplish real change in the short time-span dictated by a course like this".

"The process of communicating knowledge and creating awareness in the community is not simple and will continue for years".

Separation between self and the world is expressed, then, by frustration with the system and with people and by a sentiment of having no control over time and the resources required to effect change. This perception of separation is therefore often accompanied by lack of faith in one's ability to alter undesirable circumstances.

Students reported experiencing inability to influence 'others', who are also perceived as separate:

"Although the subject is very close to my heart, I understand there is a limit beyond which I cannot affect the surroundings or impose my opinion and my way on others".

"The discontent which motivated the research team stems from the fact that despite the type of activity the group undertook, perhaps even due to it, the change they desired in the employment conditions [of campus cleaning staff] did not occurred even after years of continuous action about it".

Some students expressed overt anxiety about efforts to motivate others to alter behavior:

"For about a month I had just geared myself up until I dared suggest it to the director and then, with much apprehension, suggest it also at the meeting of team leaders. Even then I did this very carefully and gently, I was afraid I will again be perceived as having 'a one-track-mind' but moreover I feared my suggestion would be rejected".

"I must admit I was awed when the course final project was first described to us. It was hard to believe that I, a twenty-two year-old student, can affect this change".

"At the beginning I was a bit skeptical about the success of this project, I was afraid no one would take us seriously and that the ideas we had about school would be rejected".

Altering others' behavior was perceived to be impossible:

"We have been conditioned to think that educational change is almost impossible, since a teacher is merely 'a cog in the machine' and has no real influence within the educational

institutions in which he/she functions. We also approached the project with doubt and a bit of cynicism".

One student even expressed doubt about peers' reporting ability to influence others:

"Reports of significant change that transpire from studies such as this one are either unreliable or lacking real meaning".

Another distinction that arose from reflection was between knowledge and action. This distinction was suggested in the constrained correlation students made between theory (upon which they were required to base their action in the projects submitted) and the plan of action. As for me, this distinction found expression in my focus on theory as validation of the academic quality of the course and in my reticence to appear to students as an activist. The choice I made – to bring to class only my intellectual side and discard the passion that motivates me to seek knowledge – positioned me as isolated ('a small cog') from both the university and the students. This choice reflects an internal disconnection – a separation of self and self – and a difficulty to proceed organically: simultaneously as a researcher and as an environmental activist.

Second category: I, you, the world

This category is characterized by awareness of others ('you') and of relation to them. The complexity of our environment received considerable emphasis during the course; this may have contributed to the sentiment that a considerable amount of information – multidisciplinary, ecological and social – must be gathered toward a solution of problems. Some students referred to this sentiment as detrimental to action:

"The path of social action is very complicated and poses many complicated questions. Wherever I attempt to change something, to move something, to intervene, I experience a lot of responsibility and an understanding that usually I will not be able to assemble all the variables and calculate all the existing risks. In complex systems even the most sincere and

'good' effort to affect change may result in 'bad', cause harm,
or divert things in an undesirable direction".

Some students' reflections displayed awareness of the fact that they come from academia and of the responsibility to society that the knowledge they possess places upon them. One student wrote:

"I have the will and I have a great responsibility to the [Bedouin] society I live in. I must contribute more and more ... to make a difference".

Some students, conscious of their affiliation with an institute of learning, felt obliged to become a source of accessible and reliable information:

"The diversity of participation teaches me ... to adjust the information to the listeners, so that everyone understands the facts, the consequences, and the solutions".

Kolasa and Pickett (2005) point out a common pitfall: feeling a need to simplify complex environmental dilemmas for those without academic qualifications. Academics are obligated to expose to the general public the diversity of opinion and academic discussion; to present only the results and facts purporting to be the ultimate truth is insufficient. This challenge surfaced in a reflection by K., whose action research was with a group of poverty-stricken women, whom he was leading through an empowerment workshop. He indicated the difficulty to relinquish the position of power conferred by academia:

"Being a male, a university student, and moderating a women's group - my social positioning - establishes symbolic patterns of violence within the group that in ways overt and covert influence my relations with the group... to a certain extent, taking on the role of 'leader' in the discussion preserved the patriarchic relationship instead of challenging it".

Making an especially honest and incisive reflection, he said of himself:

"My choice to regiment the discussion arose from ... my own rigidity and disbelief in the group's ability to moderate

itself. I feared that if I did not lead the discussion no new knowledge would be created. This attitude embodies a conflict with the basic assumptions I had formed at the outset of this action research. While I had stated that I wanted to allow independent creation of knowledge, I was not, in fact, open to accept any sort of knowledge save such that fitted preconceived standards".

His words express the dichotomy between theory and action that continues to characterize this category.

Nevertheless, the quotations above indicate the fading of separation between 'self' and 'others'. Reflections show that students had adopted empathetic and tolerant thinking and receptiveness to differing points-of-view, as well as awareness of others who share the will to create change:

"As an individual citizen, is it possible to create meaningful social change; is it possible even for a group of fifteen students in common? Will there be another side which cooperates, or even lets you take part? Will my voice be heard? And how?"

Awareness of others is present here together with a continuing apprehension that 'the others' will not follow when I raise the 'flag of change'.

Awareness of others' opinions did not mute the fact that the university continued to be experienced as a restrictive framework. Y. experienced this during the struggle to improve campus cleaning-staff employment conditions:

"I learnt my initial lesson in social change when the university attempted to prevent us from holding a consciousness-raising assembly about workers' rights. I understood then that we needed to create a 'confrontational' effect – that there were no two sides to this; only one side existed, the university's side, and therefore our requests, of the activists group, to try to create a joint process, were rejected out of hand".

Or as S. and F. experienced this, when they attempted to increase the recycling in the college they attended:

"...in fact the owner has no commitment or special will to work with university organs and/or to participate in research that could ultimately present the college in an unfavorable light. Therefore college administration was at best indifferent to our presence".

In this second category, time remains an essential factor defining reality, although a sense of partial control over this resource, and an ability to use it, do exist:

"I chose to employ constructivist teaching modes in order to achieve this goal, despite the knowledge that the time I would be able to devote to their realization was very limited".

"Of course, except for personal interest, considerations in picking the subject also included the period of time available for research".

Here the self is experienced as a 'fragile-whole'. Glimmerings of holistic action appear, alongside reports of the difficulty to adhere to personal essence in the face of limitations posed by the surroundings.

"These conclusions about my own conduct put into question both my understanding of the system and my understanding of my ability to devote time to the action. It is possible that the lack of time which was inherent to this undertaking was a convenient pretext to the repudiation of participatory principles in the action I led... Lack of time and rigidity of the system served as an excuse".

This quote echoes the sentiment of incoherence that I had experienced at the beginning of my career as a sustainability lecturer – the mental disconnection between a theoretical outcome and the outcome of action. I also experienced the difficulty in holding to my own essence when teaching and in the presence of others when I decided to bring myself as a whole – a researcher and activist – to the classroom. The severe tension I felt following that decision found occasional expression in physical symptoms of stress and in a feeling of loneliness vis-à-vis the university. However, further down the road I began to perceive students as

allies in the attempt to change the university's teaching methods, and the sense of responsibility toward them progressively became the determining factor in the choice of my action modes.

Third category: You and I can change the world

This category is characterized by a sense of ability to affect change. Students' experience in action research focused their insights into the complexity and dynamism of reality:

"I would not presume to say that we have changed the culture of debate in S.'s group, but action research helped me understand that the system in which we functioned is dynamic and, therefore, changeable".

Awareness of complexity could have discouraged action; instead, it encouraged students to investigate it. This transpires from the reflection of two students who attempted to reduce the consumption of paper on campus:

"In order to create change in the existing system it must first be studied in depth. We did this by observing the system and its functioning from outside, in addition to the contact we made with elements functioning within the system".

From the following quote it emerges that action is based on discernment of the forces creating a problem and from identification of forces which may be harnessed toward change:

"Once we were engaged in the system, we learnt how to face various difficulties that arose by eliciting feedback on our mode of action inside it and by implementing steps for improvement conforming to that feedback. We realized there was more than one way to affect change".

In the preceding paragraph, the use of the expression "engaged" is instructive. It designates the activist-researcher as an integral part of the system, one that can influence and alter it from within by small steps accompanied by continuous reflection. Such a process reflects the understanding that it is impossible to foresee complexity fully, since reality constantly changes; every behavioral variation changes the system in unforeseeable ways. The consciousness of the existence of various means to achieve change

expresses a distinct mode of conduct in the world, with a sense of freedom of action and with the flexibility that develops from the recognition that 'I' am part of the world; and that therefore the world cannot be a constraint.

Reflections also expressed awareness of the fact that being the vanguard of change need be accompanied by an understanding of others in the system as subjects with differing values and conceptions:

"To profoundly and broadly influence the system and its participants one must first discover the values and preferences of those involved".

Being the leader of change must also be attended by responsibility and personal awareness:

"As I have stated, I learnt that as generator of change the weight of responsibility rests with me; that I cannot be blind to costs; that these costs worry me and dictate caution; that the question of effectiveness is to me paramount and I do not wish to act 'just for form', just to be able to say I have done something".

An experience that was noted by students was self-discovery as individuals capable of leading social processes. Many reflections brought up the potency of commitment to a cause:

"I have never created change in a [social-ecological] domain such as this and I am glad I had the privilege to do so. I discovered that when the subject is close to my heart I am assertive and motivated to try and rectify the situation that in my vision requires change".

This experience represents the activist-researcher's discovery of being part of the system:

"As a creator of change I discovered that the process of change is a mutual process. When the teacher changes his conduct students will also act differently, and vice-versa. In order to change the culture of discussion in class we first altered the conduct of moderators. This impacted the course the lesson took. S. indicated that when children acted more

politely and amicably it reflected back on herself; she found more pleasure in class and the children's company".

The practice of conducting change was experienced as an achievement, even in cases where there was no material transformation of the environment:

"Despite the disappointment from the results of the action, we feel nevertheless that we made a significant difference. Yes, cigarette butts are still strewn about at the entrance to the buildings, but the fact that we rose and acted for a goal that is important to us caused a change in our perceptions and in those of the buildings' inhabitants. They realized that some people cared about the situation and are ready to act to change it... A conceptual change is the real beginning and the only approach to affect meaningful change. The fact that we got up stimulated us and made us understand that life could be lived in a much more active and caring manner. This is the real difference".

The experience of ability to affect change was accompanied (to the surprise of many) by the discovery that others were willing to follow the initiator of action. A Jewish student, who together with a Bedouin partner initiated an educational intervention project in a Bedouin township, wrote:

"At first I was very apprehensive about preparations and fund-raising, I was not at all sure if people will actually join this undertaking and I did not believe it will indeed come into being. However I discovered that people do join educational and environmental initiatives, and we did gather most of what we needed".

Another student wrote:

"Thanks to this project, to my acquaintance with the SSJ organization [Students for Social Justice], and to my exposure to theoretical studies, I discovered that the appropriate and preferred method to create change is not the confrontational one but the inclusive one. I now have a deeper appreciation that in order to arrive at solutions, to settle disputes and conflicts, we must understand that the other side is not a rival but rather a partner. In other words

- when a conflict exists the problem does not lie with one side only, it resides with both sides; the best and most effective solution will be reached only through full cooperation. Therefore I intend to adopt this attitude and to apply it to every conflict, dispute or problem I shall tackle in the future".

Another student, who attempted to improve environmental education in a school district, wrote:

"...when I left school that day I felt our ideas were not falling on deaf ears and that the people with whom we engaged wanted this change as much as we did".

Still another student wrote:

"Having ourselves introduced the notion of bottle recycling to the agenda, my friends and I were prodded to think twice before disposing of waste. Starting the Facebook group and seeing 37 friends join (hopefully more will join in the future) really made me happy. We were able to break the limited circle of friends and acquaintances and influence wider circles that showed interest in our group and our action".

One more student wrote:

"...Through a simple action of starting a Facebook group we were able to draw together over five hundred people 'under one roof' and to enlist them in one measure or another to the city's environmental efforts; we must therefore erase the misconception that asks 'what change can a single person create?'. Yes he can!"

A special surprise awaited those who attempted to elicit help from authorities within the university:

"I was stunned to discover that bodies in the university wish to assist you in holding such an event; the Students' Union helped over and above my expectations, so did the 'Division of Social Engagement' in making the contacts with the mentoring project and with Youth Seeking Science..."

It transpires that constraints set by the surroundings and limiting those who wanted to act, averred to be illusory:

"The most important thing that I have learnt is to not to be afraid, because fear paralyzes. If anybody truly believes in something he can do a lot if only he shakes off the shackles of fear".

With this grew the understanding that the required change is a change in world-view, which calls for patience and faith:

"The conventions of the creation of knowledge, truth and order will be altered and redesigned through a new dialogue that will also challenge the educator. This process requires time and demands patience and a strong faith in the path".

"The most meaningful conclusion I drew from this project is that change is both possible and desired when it is tackled following critical (not destructive) thinking and out of a pure intent to improve".

Time as a limiting adjunct is still present; but the time-spans that are required for processes of change are not perceived anymore as intimidating:

"I understood that it is necessary to put in much work and invest a lot in order to achieve change, and one day of action is certainly insufficient; consciousness must be built up step-by-step".

A majority of students noted the connection the course created between theoretical knowledge and practical knowledge; the course enabled them to put theory in the service of action:

"I think that the main point I took from the course is to work in an orderly manner, to read the field and to understand the individual actors".

For many students, the association of theory and action became natural and indispensable:

"Of course, here [action research] it is different. More research is necessary, including a survey of the literature, entry into an existing system, collection of data by various tools and its analysis".

Students' reflections testified to their awareness of personal values which direct their choices and their action as subjects:

"During the lessons in class and while I was preparing the project I was able to turn to the authentic place within me that does not believe in doing good by creating evil, that believes in non-violent struggle... Action research allowed me to try and return to places that for me are more natural – to be positive, to attempt to do good from a non-competitive, non-aggressive space...".

The key word that appears here is attention, both to others and to self, and action as an integrated and whole being:

"Values are the main and most important thing. To give space and expression in action to my inner belief in the goodness of man. That it is right and possible to act in this way, without any worry. Thank you for the opportunity".

As far as I, as teacher of the course, am concerned, change became evident in the self-confidence I gained to appear before students in my entirety as a researcher and an activist simultaneously. During the concluding talk of the course, when the role of the moderator in the process of developing environmental citizenship was discussed, I posed for consideration the manner that I chose to employ in guiding their action research; I submitted my choices to critical evaluation. Although no personal reference was made to the educational model I set, it could nonetheless be perceived from reflections of the second order that responded to the question: What can be concluded from our experiences on the essence of education toward environmental citizenship? The following example is quite typical:

"The course broadened our horizons and exposed us to a paradigm that was not very well known to us previously. Our understanding now is that the educator is not only a teacher but also a model that allows thinking and criticism and encourages toward action in order to achieve continuous improvement... In the years to come, we wish to accept this responsibility of educators. We want to be the educator who assimilates ecological thinking, who allows criticism, who encourages action, who is in the service of

society. We are thankful for the opportunity given to us to participate in research of this kind in which we proved to ourselves that change is possible. It begins with much goodwill... and 'the sky is the limit'".

Similarly, my choices as to the manner of conducting the course come through in the following reflection:

"Looking back on how the course unfolded and on the process of the action research we executed, we found... [that] the teacher's purpose is to provide the basic tools for the understanding of complex systems, which can allow a person who aspires for change to create it independently without appealing to the educator. An educator toward sustainability must be on eye-level with his students; one cannot approach students in an arrogant manner, one that says 'I am a contributing environmental activist and you are lazy and harmful'. It is our opinion that this is the main problem of sustainability educators today. It creates antagonism in students and reduces the willingness to cooperate in achieving the common goal".

Action Research approach and development of environmental citizenship in academia

Education toward environmental citizenship in academia is challenging due to the substantial divergence between academic ethos and the culture of environmental activism (Moore, 2005). Students' reflections in the study indicate that the disparity between cultures is experienced as oppressive shackles in the "I, you, and the world" category of perceptions. Experiencing an intimidating environment, on the one hand, and feeling unable to control time, a partnership with peers and the university's limitations on the other hand - indicate self-perception as an element external to the social-ecological system.

The methodology of action research is considered to be an empowering process (McNiff, 2013). In this study, students' experience of action research and their exposure to ecological thinking liberated them from a sense of oppressive shackles; and allowed them to acquire a sense of control and an ability to

engender change: they had adopted of a pattern of environmental citizenship. Duenkel and Pratt (2013) have described a similar process among students of Science Education, who had experienced action research. In their opinion, conducting change via the reflective process of action research was a help to students in freeing themselves from the restrictive positivist paradigm (Guba and Lincoln, 1994) and supported them in developing faith in their capacity to affect change and to act as environmental citizens. This process may be considered as transformative learning (Kegan, 2009), wherein presumptions and personal tendencies are challenged by a learning experience. New insights into reality and into the perception of self are developed by this process.

The role of the teacher in developing environmental citizenship via Action Research

When supporting action research the lecturer is out of his accepted role as a communicator of knowledge. As action research proceeds, aspects of knowledge previously unfamiliar may appear before the teacher and he is required to become a partner to learning (Duenkel and Pratt, 2013). However, my experience shows that the teacher has a highly significant role in supporting students' process of transformation. This role begins with the willingness to appear before students authentically, both as researcher and activist. Although my contact with students could have been characterized at the outset as "I, you, world", my willingness to come before them as an example of an environmental citizen encouraged them to begin action and confront the limitations they faced.

When Students tended to forego theoretical knowledge and pass directly to solutions for change, another aspect of the teacher's role became apparent. As a lecturer and as the embodiment of the "action research" approach I was called to remind to students the importance of the preliminary study of a system in order to discover the field of forces and the eventual hubs of influence, and to emphasize the importance of theoretical knowledge as a means to designing appropriate solutions. The requirement to accompany action research with systematic data collection and reflective

research was at first perceived as an unnecessary yoke by those who were awakened to the need to affect change. My role as lecturer-advisor was to evoke the importance of these stages in order to conduct reasoned change. When I put my personal experience as an activist at the disposal of students a relationship of "you and I can change the world" began to form.

Students' initial tendency to create a simple link between cause and effect obliged me as a teacher to encourage systematic and critical observation of reality and to assist students in observing the problem they wish solved in a fuller manner. Here also my experience as environmental activist served. The role I performed in class was one of initiating "liberating education" (Freire, 1998) or "transformative learning" (Mezirow, 1997); this reinforced my relationship with students in the "you and I can change the world" mode. This relationship was also strengthened by the performance of another important and meaningful role: orchestrating processes of mutual learning of separate study teams. At meetings in which teams presented progress in action research, I encouraged the creation of a learner community that allowed students to experience the advantages of varied points-of-view on the investigated phenomenon and of the power of cooperation in conducting change. Duenkel and Pratt (2013) report a similar process among students of Science Education, who had experienced action research. Another aspect of the moderator's role mentioned by these researchers is the importance of remaining in a chaotic state (they call it "the mush state") before forming a concept of right and required action. The support provided to students at this stage by the moderator permits them to dwell in ignorance safely and allows an accurate definition of the problem and its solution to emerge from uncertainty. Finally, the course "From ecological thinking to environmental citizenship" dealt not only with encouraging environmental citizenship, but also with the teacher's role toward this. My willingness to submit the teaching model I represented in the course to students' criticism was a challenge that greatly fortified my experience of common learning with students and the sentiment of "you and I can change the world." In this respect, it can be said that I had also undergone a

process of changing my frame of reference (Mezirow, 1997). Students' reflections showed that their understanding of the essence of environmental citizenship was enhanced by the educational model I embodied and my willingness to have it discussed.

Conclusion

Beneficial civic education must include pro-active endeavor in the public arena. Some see endeavor as the pinnacle of civic education (Chawla and Cushing, 2007). Environmental citizenship focuses this requirement on social-ecological issues, yet applies it to the biosphere as a whole; that is, environmental citizenship extends it toward universal citizenship. At the basis of environmental citizenship (and active citizenship) is a **perception of the world** as a complex, open and changing system and a **self-perception** as someone who belongs to that system and is therefore capable, even obliged, to act in a way that will render robust and sustainable.

In analysis of reflections about these two perceptions, three principal types were discovered that progress from a positivist approach on to a constructivist- and critical approach (Keiny, 2004). The first is the "I and the world" type, who perceives reality as separate entities of organization and content and therefore doubts the individual's ability to create change. The second is "I, you, the world" type that recognizes the existence of like-thinking others, who may even expect me to act. Lastly, the "you and I can change the world" type perceives itself as part of the socio-ecological fabric and is conscious of his/her ability to conduct systemic cooperation at differing organizational levels, in order to affect change.

Reflections also indicate that students' exposure to the notion of 'ecological thinking' and the experience of 'environmental citizenship' through 'action research' allowed students to construct a bridge between academic culture focused on theory and the activist culture that tends toward practice. It transpires that there is synergy between these three terms. Duenkel and Pratt (2013) arrived at similar conclusions in their study of teaching trainees.

Nonetheless, it must be remembered that teaching trainees may be more action-oriented than B.A students in academia; additional research is therefore called upon in order to base such generalizations.

Another consequence of this synergy arises from some students' reports that many elements in the system averred to be ready to cooperate with them once they themselves started acting; at this, their systemic perception was enhanced. A similar experience was reported by some of the students who participated in social projects in the PAL approach, in a study by O'Connor et al. (2013).

I would like to conclude with a personal note. One of my most important insights from teaching the course, similar to those of the students, was the understanding that separation of my identity as a teacher in academy and my identity as a social-ecological activist was unnecessary. I was not alone in my desire to change the system. Today I have the confidence to raise the call, and the certitude that if it is made, it will be answered by others.

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Biography

Dr. Noa Avriel-Avni is an environmental education researcher in Dead Sea & Arava Science Center, a Research & Development

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Peer assisted teaching scheme and Participative Action Learning-Action Research: A winning combination

Leone Cameron

Abstract

This study evolved as the third cycle of a specific action research project to improve teaching skills and the student experience. The overall aim was to promote deeper, work-relevant learning through implementing a new method of assessment (data from the previous action research cycles indicated that the former assessment task promoted rote and surface learning). The study, supported by a peer assisted teaching scheme, combined participative action learning-action research (PALAR) and to change an assessment piece from a traditional multi-choice test to an innovative work integrated learning audio recording task that tested application of theory to a simulated real-world task. Domestic and international students (119) in an international marketing course collaborated in teams to develop skills in radio interviewing. Student responses to the change were assessed quantitatively (a specific question in the formal student feedback instrument) and qualitatively (open-ended questionnaires and a focus group). Of the 88 respondents to the specific question, 60% thought the task was moderately, very or extremely important to their learning. Major themes from the NVivo® qualitative analysis were teamwork, engagement and communication; creative and deeper learning experiences; practical and work-related assessment; and enjoyable and fun learning. Further action research cycle adaptations of the assessment will increase engagement and deepen learning.

Keywords

Work integrated learning (WIL); Participative Action Learning Action Research (PALAR); assessment; international marketing

Introduction

The need for innovation in and adaption of pioneering methods of assessment has been intensified in regional universities by economic challenges, declining government support and the continuing boom in student numbers (Byrne, 2011; Bokor, 2012). Many academics are reluctant to leave the comfort of their multi-choice tests that are supplied as support materials by publishers to lighten the workload of academics. In addition, the pressure in Australian academic communities to publish or perish has continued to increase, and marking budgets continue to decline (Lewin, 2013). These factors have led to a decreased appetite for investing time in innovative curriculum design, including development of creative assessments and marking strategies. According to Becker and Johnston (1999), cost, consistency and content are the three major factors to consider regarding assessment in terms of students, academics and the administration within universities. These 'three Cs' of assessment have apparently contributed to a paucity of opportunities for developing expertise in assessment, and made it difficult for those staff wishing to further their academic career as both teacher as assessor and researcher. Further 'Cs' identified by Lewin (2013) include concerns for assignment content and marking consistency.

Many forces affect an increasingly diverse cohort of students entering our academic institutions. One outcome is an even greater need for skills that improve employability upon graduation (Dale and Povey, 2009). Thus, academics are under pressure to develop new teaching methods, including those that enable learner-generated content that contributes to long-term employability in a global context. Adjusting assessment methods is a key part of this approach and must keep abreast of specific work conditions such as those within the 'tourism and hospitality sector ...preparing

students for the global workplace' (Vasconcelos, Balula and Almeida, 2013).

Through a specific action research project to enhance teaching skills, this project developed in response to a desire to provide a sea change in terms of assessment tasks.

Assessment and measures of learning

Measurement of students' success in terms of assessment must be systematic, valid and reliable. However, student learning is frequently measured in written form, which is not always the best measure of comprehension and knowledge attainment (Smith and Lovat, 2003). These researchers suggest other methods such as observation, completed tasks and talking with others, while Guy (1999) suggests that learning techniques and measurement of scholarship must account for the socio-cultural experiences and backgrounds of learners. Notwithstanding this however, the success of student assessment in multi-cultural classes may be enhanced with PALAR contributing appreciably to the opportunity of self-directed input into assessment outcomes. Berrett (2012) found that assessments should challenge students by demanding analysis, re-contextualisation of information, and reflection on their own opinions, which includes being able to provide contradictory arguments and is ideally supported by the action learning process.

Ramsden (2007) suggests that as academics we need an approach that does not try to change our students; rather, educators must build quality into the created learning experience, which attempts to change the way students experience learning and build their perceptions of the learning event (e.g. an assignment or test). In addition, Steffe and Gale (1995) suggest students construct knowledge and reach meaning through both individual and collective experiences. This is complimented by the PALAR methodology which seeks to 'appreciate, question and seek answers from new angles.' (Zuber-Skerritt, 2011, 2).

Assessment through multi-choice questions

The efficacy of multi-choice questions (MCQs) as an assessment tool has long been a source of contention (see Berk, 1998, cited in Williams, 2006). Multi-choice questions are designed to enable students to identify the most appropriate answers relevant to the question whilst determining students' progress (Colgan, 2006). However, Biggs and Tang (2007, 203) criticise MCQ for enabling students to attain a pass grade by applying 'identification', one of the least challenging cognitive processes. In this context, it could be asserted that some instances of MCQ assessment do not give students the opportunity to demonstrate the higher levels of learning according to Bloom's (1956) hierarchy of learning processes: evaluation, synthesis, analysis, application, comprehension and knowledge.

MCQ results can also be distorted by academics applying penalties to discourage guessing (Biggs and Tang, 2007). In terms of multi-cultural teaching, MCQs have been criticised for producing discriminatory results for international students for whom English is a second language (Paxton, 2000); in an Iranian study, such students showed positive attitudes toward alternative assessment practices (Sadeghi and Khonbi, 2014). More generally, comprehension and linguistic skills can also affect MCQ results (Williams, 2006). When fervently applied, this method of measuring acquired knowledge can be seen as an enemy of developing deeper understanding (Gardener, 1993).

Participative action learning-action research (PALAR) and assessment

Gatfield (1999, p. 372) confirms that assessments that involve peers can be good for the group and can reinforce engagement and cooperation among both domestic and international students. One such approach to assessment practices is to design them to support the PALAR model. O'Connor, Smith, Crane, Brough, Shaw, Franz and Larkin (2013, 125) found participative action research significant in the 'explicit invitation to students to explore and develop their understandings'. The PALAR methodology is also a

particularly effective framework in the development and growth of practitioners' teaching and learning praxis. Zuber-Skerritt (2009, p. 9) endorses the PALAR practice as an investigative approach that is 'effective in unpredictable and changeable situations'.

In the PALAR model, the assessment tasks must consider the power and control issues of group learning, and must acknowledge, if not reward, the collaborative process (Boud, Cohen and Sampson, 1999; Keppell, Au, Ma, and Chan, 2006). A PALAR cross-cultural team activity enables interstudent power and control to be expressed through the verbal assessment developed for this project. Boud et.al. (1999) and Keppell et. al. (2006) also contend that assessment in terms of peer learning, such as that implemented in this study using PALAR teams, must promote positive practices. To achieve this, unambiguous assessment standards must be clearly communicated to students (Sadler, 2010).

Deep learning and assessment measures

The key to good assessment is to recognise the difference between memorising (or surface learning) and developing deeper understanding, known also as 'deep learning' (Bourner, 2003). Bourner (2003) suggests assessments that require students to develop understanding can encourage deeper learning. In terms of deeper learning however, Vahalia, Subramaniam, Marks and De Souza (1995) suggest that MCQs are sometimes poorly written, and lead to assessment of recall rather than deeper learning. Biggs and Tang (2007) put forward the argument that well designed assessments force learners to higher levels of achievement and deeper learning. To further enhance deeper learning, Reiter-Palmon and Robinson (2009) and Harvey and Chia-Yu Kou (2013) suggest that a clearly defined and shared problem promotes deeper engagement and learning. Many of the holistic characteristics of assessment for learning (AFL) proposed by McDowell, Wakelin, Montgomery and King (2011) including support through peer interaction, are authentic and relevant to job readiness, and as such, they contribute to deeper learning by

fostering student autonomy and independence while also giving power and control. The assignment and assessment tasks developed for this project specifically aimed to develop and measure deep learning.

Work integrated learning (WIL)

In terms of a future focused on life and work (Boud and Falchikov, 2007), assessment with a long-term emphasis on contextualised participation and practice is desirable. This is the philosophy underpinning work integrated learning (WIL) and the associated assessment. In WIL, students engage in specifically designed activities that apply disciplinary knowledge and skills in a real-world context. Such activities are integral to students at undergraduate level and must not only benefit graduating scholars but also the industries and the professions in which they will eventually serve (Smith, 2012). While there are numerous types of WIL experiences, this project used the 'industry-professional component tier', that is, applying theory to work practice, one of the forms of WIL used by our university (USC, 2014). WIL must be assessed in the classroom, provide evidence of graduate goal achievement, and demonstrate its transferability to the workplace (Daugherty, 2011; WIL-QUT, 2014). It is imperative that these activities, including assessment tasks, provide authentic, real-world, deep learning experiences. Such experiences are valued by global organisations and can position regional universities to provide workplace-ready graduates, a major selling point in a competitive global education market. Reflective practice, as part of the WIL assessment process, has been identified as promoting not only deeper learning, but also lifelong learning (Sykes and Dean, 2012).

The project

Previous cycles of the project

The project to implement an innovative assessment task formed part of a program that began in June 2013, when the author became

part of a Peer Assisted Teaching Scheme (PATS). This program, originating in 2009 with Associate Professor Angela Carbone, now Director, Education Excellence Office at Monash University, was supported by the Australian Governments Office for Learning and Teaching. In that project, Carbone (2014) found that levels of student satisfaction increased when participants engaged in the PAT's scheme. The PATS project was originally offered at the University of the Sunshine Coast in 2012 to 'inform and equip academics with skills and strategies to reinvigorate their teaching'. This was done by pairing academics who had sought assistance through participation in the PATS program with mentors recognised for their teaching excellence, and a collaborative PATS team.

The combination of PATS with cross-cultural participative action learning action research (PALAR) activities, from an academic perspective, enabled the broadening of the learning experience. Similarly, Singh (2008, 241) found that applying PALAR to interactive oral assessments led to 'improved learning of content for learners' through both their peers and assessors.

Initially, a participative action learning action research (PALAR) methodology (Zuber-Skerritt, 2011) had been used to assist in modifying an International Marketing class in the School of Business (through two action research cycles), with a view to improving student satisfaction within the course. The class was composed of both domestic and international students from a wide variety of majors. The two PALAR cycles were used to reinvigorate the learning experiences of both the domestic and international students. Students in the first PALAR cycle had experienced relationship marketing strategies that had increased engagement through cross-cultural relationship building (Cameron and Allen, 2013); in the second PALAR cycle, blended learning strategies were used to accelerate development of communications both inside and outside the class room (Cameron, 2012; Cameron, 2013). In addition, WIL had been successfully integrated into these cycles, enabling students from diverse backgrounds to be challenged to creatively solve problems for regional businesses.

The PATS project offered a further exciting opportunity for a third PALAR cycle, complete with peer support. At this point, we intended to use PALAR to further enhance the opportunity for both domestic and visiting international students to build relationships as the mixed PALAR teams developed joint ownership of the assessment task. The PATS mentoring process had questioned the value of the traditional MCQ tests that were part of the formal assessment. These tests were conducted in class in weeks 5 and 13 of semester. The MCQ tests had been viewed as a reasonably quick and easy form of assessment with which to reduce marking load and allow more time for research and other activities. However, the MCQ process had made the students passive participants in the education process: previously collected data suggested that deep learning was not promoted by the MCQ test and students had a tendency to rote learn theory rather than developing a sense of meaning that is promoted through questioning opportunities. While the previous PALAR cycles had resulted in changes to many aspects of the course, including support 'tools' and communication methods (Cameron, 2012; Cameron, 2013), the course methods of assessment had never been evaluated for relevance and effectiveness. Following reflection on the first two cycles, a review of assessment tasks was completed, which supported a decision to move from the MCQ test in Week 5 to an innovative new assessment to which none of the students had previously been exposed.

Project goal

The goal of the project was to provide students with an assessment that promoted learning through PALAR, enabling students to have the power to control their own learning, which in turn, promoted deeper, work-relevant learning experiences through the implementation of a new method of appraisal. Simultaneously, we wished to extend the benefits of relationship building (including cross-cultural relationships) gained from the previous cycles.

Project design

In this third PALAR cycle, we implemented the new method of assessment and examined the students' responses to the change. The student cohort included 119 domestic and international students from a variety of major studies: international business, tourism, leisure and events, marketing, engineering and communications. Of these, 41 were visiting study-abroad students.

The new test was developed around a mock radio station recording. This audio sound file was made available to all students by both email and the university's online platform, BlackBoard. Students were required to listen to the audio recording and then invited to respond to the mock radio announcer's questions. Students were charged with responding to the questions in the professional consulting role of an international marketer.

To continue improving the cross-cultural learning experience developed in the previous PALAR cycles, the students were allocated to PALAR research teams consisting of both domestic and visiting international students to work on producing their individual assignments. Questions posed in the pre-recorded radio interview focused on key theoretical topics covered in the first four weeks of the semester. As part of their audio response, students were also required to provide their own opinions, judgements and outlooks on social issues and the relevance of the theory.

Before recording their audio responses, the teams of students were taught about the benefits of PALAR and encouraged to research together using Revans' (1980) action learning equation, $L=P+Q$ (i.e. learning equals programmed knowledge [found in textbooks] plus questioning (the learner questions the programmed knowledge)) as the basis of developing deeper knowledge. This process adds depth of understanding to their theoretical answers. Simultaneously, the action learning questioning between team members from differing cultures helped each student to develop their own opinions for expression in their individual audio responses to the questions posed. Thus, the exercise provided further opportunities for cross-cultural communication and

engagement with the topic, while adding a further array of multi-cultural views to the learning experience. After completing the cooperative research, students were then required to assist one another to record an MP3 audio file of each student's responses, including their own personal opinions. Responses to the pre-recorded questions could either be cut and pasted into the original radio interview or separately recorded as a file of their responses only.

Before beginning the task, all students were provided with a copy of the marking guide and given a comprehensive tutorial workshop in which the assignment task was analysed and discussed in terms of the key points from the marking criteria developed specifically for this assessment task. The criteria assessed students' skills in critical application of discipline knowledge and theoretical concepts, skills in critical analysis of a number of aspects of the interview topic, and their professionalism and communication and technical skills (Appendix 1).

All students were provided with three opportunities through which they were encouraged to give feedback about the new assessment task: (1) a standard Student Feedback on Teaching (SFT) survey instrument, which included a specific question about the audio assessment and also invited open-ended comments, was administered; (2) they were given a formal, open-ended questionnaire; (3) students were invited to join a focus group to discuss the assessment.

The SFT question was 'To what extent have the WIL assessment activities been important to your learning experience?' Responses to the question were provided on a seven-point Likert Scale: *extremely important; very important; moderately important; neutral; slightly important; low importance; and not at all important*. The individual responses in each Likert category were totalled and expressed as percentages of the total number of responses.

The questionnaire was developed with regard to information gathered in the previous PALAR cycle and in specific response to informal student discussions and feedback that occurred during

the semester with a focus on identifying the benefits of the new verbal assessment task and its contributions to work integrated learning.

The informal focus group discussions were conducted at the end of semester in each of the final tutorials; between five and seven student volunteers share comments and ideas for the benefit of future students.

The qualitative comments from the questionnaires, focus groups and SFT were transcribed, coded, and organised into themes (nodes). They were then analysed with NVivo 10® software (QSR International Pty. Ltd., Asia Pacific Sales Office and Head Office, Doncaster Victoria, http://www.qsrinternational.com/products_nvivo.aspx), which produced interrelated themes and frequencies of the themes (Mason, 2002). This method of analysis is particularly popular in evolving disciplines such as ‘media and cultural studies’ to understand and interpret qualitative data, with ‘unrivalled capacity ... [and] compelling arguments’ about how things (e.g. innovative assessments) have worked ‘in [a] particular context.’ (Mason, 2002, p. 1-2).

Results and discussion

Overall, both the quantitative and qualitative results showed that a majority of students viewed the new assessment task very positively.

Quantitative results

Eighty-eight of the one hundred and nineteen students (73.9%) responded to the question about the new assessment. Of these, 28% stated that the task was *very important* or *extremely important* and a further 33% thought the task *moderately important* to their learning (Figure 1).



Figure 1. Responses to the specific question on the new assignment in the Student Feedback on Teaching (SFT) survey.

Qualitative results

The qualitative results were derived from the comments of the open ended survey with 90 of the possible 119 students responding. The four principal themes that emerged from the qualitative analysis of student responses were very positive towards the new assessment (Figure 2).

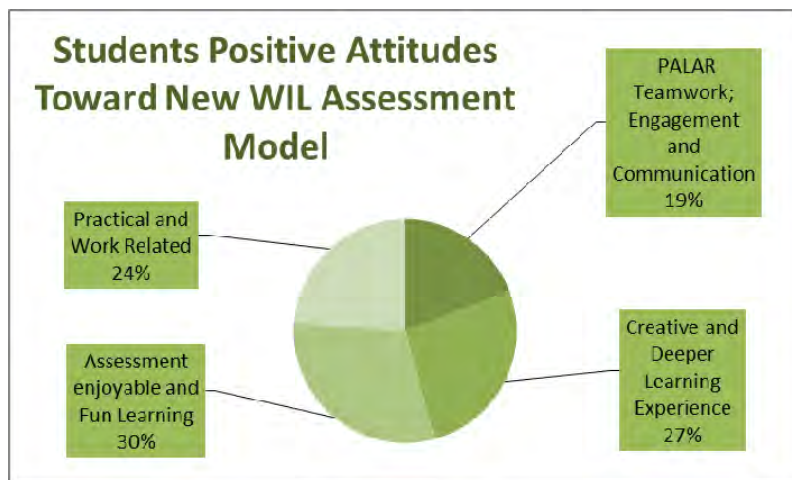


Figure 2. Principal themes extracted from the Nvivo® analysis of students' attitudes towards the new assessment task.

1. PALAR teamwork, engagement and communication

The NVivo analysis identified eleven coding themes; any responses less than two percent have been disregarded with only the four key themes displaying significant outcomes as presented in Figure 2 above. These themes highlighted that nineteen percent of respondents commented on the benefits of the PALAR teamwork, with engagement and communication as beneficial outcomes of the assessment. These factors enabled international students to improve their English language and communication skills. One student noted that their "Communication skills and public speaking skills" had been improved with the support of domestic students who, no doubt, also benefited from cross-cultural communication opportunities provided by engagement in the PALAR teams. The new assessment provided the student with learning experiences that improved English language skills while simultaneously providing better preparation for the workplace.

Another student expressed the benefits of the engagement and teamwork: "Working in teams whose members come from

different cultural backgrounds ... adapting principles to incorporate cultural awareness in the radio segment was new and interesting". Guy (1999) pointed out the importance of the socio-cultural backgrounds of students' to their learning experience. Another student expressed the synergy of the PALAR process by noting "I had many different personalities in my team and I was able to work with everyone with a common goal ...to entertain other people was a highlight." This comment reflects a key aspect of PALAR, that is, the team members share the crucial aspects of the assignment in order to collaboratively solve problems (Lamont, 2008). It also reinforces the findings of McDowell et. al. (2011, p. 762) who's work into assessment for learning (AFL) found that peer learning such as that found in PALAR can 'increase and extend student participation' and it also identified that 'students taking a deep approach may be more likely to engage in peer learning'.

The assessment also encouraged both domestic and international students to seek to share, explore and reflect upon the theory, and to afford deeper meaning to the knowledge gained through the experience; this aligns with the work of Larkin and Beatson (2014) and is reflected by one student who suggested they experienced "Greater awareness, consideration, teamwork ... and real world experience".

2. Creative and deeper learning experience

This second theme identified by 27% of respondents indicates that students experienced 'learning through assessment' (McDowell et. al., 2011). However, they also reflected upon the challenges of the project. For example, one student expressed the benefits of the assessment in terms of creativity and deeper learning: "Careful analysis needed to be made of international markets – making sure you fully understand all aspects ... for example ... justify selling luxury items when also studying the theory of sustainability." This student's reflections support the proposition that the students' WIL experiences promoted reflective practice, which reinforces both creativity and a deeper learning experience in accordance with the findings of Sykes and Dean (2012).

Similarly, another student commented, “The project developed a deeper level of understanding”. This statement reinforces Ramsden’s (2007) recommendation that ‘academics need to find approaches that create change in the way students experience learning and build their perceptions of the learning event’ (45)’. Further, such comments reflect the deeper learning students gained through questioning theoretical (programmed) knowledge (Revans, 1982, 1984) and sharing their personal reflections, positions and stance on the theory. This greater level of awareness aligns with the experiences of Bourner (2003), who identified that assessments that enlarge understanding can encourage deeper learning. Thus the WIL ‘radio interview’ provided an innovative way of increasing engagement and encouraging creativity by permitting students to express their own voice, simultaneously promoting deeper thinking skills.

The success of this action learning process evolved as students worked together to research and prepare. This illustrates the ‘reflection-in-action’ recommended by Schön (1987) that is, the process enabled students to shape what they were going to say in their verbal assessment while engaging in PALAR teams to find creative solutions to the questions posed.

3. Practical and work-related assessment

Students were aware of the contribution of the WIL verbal assessment to building work-ready skills. Twenty-four percent of respondents nominated the practical and work related qualities of the new assessment as benefits. Students found the replacement of the MCQ test with the verbal radio interview “A refreshing change from other assessment[s] taken since being at university ... it felt more practical than the usual exam or business report”. Another student’s comment reinforced the importance of this experience: “the PR radio was a cool way of assessment – preparing us for the ‘real world’ “. Singh (2008) recommended alignment of assessment and oral assessment in ‘bridg[ing] the gap’ between classroom and the ‘real world’ (p. 246).

4. Enjoyable and fun learning

The most frequently cited theme (30% of respondents) was that the assessment was enjoyable and made learning an experience filled with fun. For example, “I enjoyed completing the radio interview ... I found it easier to learn using this technique” and “verbal test was interesting and a good idea”. This comment confirms the findings of Singh (2008, p. 241), whose work with verbal assessment found the ‘interactive nature of the oral assessments led to improved learning of content for learners from their peers and assessors’. The enjoyment and fun came through also in more general comments with one student suggesting a “Big thank you. This was my favourite assessment this semester ... I loved this activity and other creative things in the lecture and tute”. From an international students’ perspective came comments such as “I enjoyed the Aussie style of this activity” and “It was hands on and gave me a real world feel - the variations in assessment”.

Negative responses to the new assessment task

The introduction of this new and innovative WIL assessment task project has been warmly accepted by many students, as the previous quantitative and qualitative data indicates. This appears to be in line with the assessment for learning approach recommended to encourage deeper learning by McDowell et. al. (2011). Notwithstanding this, research by Williams and Kane (2008) into assessment found this to be an area in which students express their highest level of dissatisfaction. Thirty-one per cent appeared resistant to the assessment change – this may have been as a result of there being forces outside of their comfort zone. Fortunately, of the small number that did not readily adapt, one of them suggested that ‘The radio interview was really only appropriate for those going thought [sic] to be marketers – not everyone doing the course will do so”. Notwithstanding this however, these generic work-integrated skills developed by such activities are transferrable to other workplace activities. Gault, Redington and Schlager (2000) suggest that WIL can provide graduates with major professional benefits. Contrary to this student’s comment, the work of McDonnell and Curtis (2014)

suggests that: students who have the opportunity to gain a greater shared understanding through assessment can improve collaboration and develop their ability to challenge and question - a highly sought after work-ready skill for any career.

A second student found fault with the marks allocated for knowledge and communication skills, stating “I feel I could have received a higher grade on this task based on my knowledge rather than being marked on the way I speak into a tape recorder”. In designing this WIL assessment piece, marks were allocated to reward both application of theory and work ready communication technology skills evenly (see Appendix 1). Patrick et al. (2008) validated this method of measuring WIL, suggesting that assessment must be shaped to fit the needs of business – in this case, PALAR enhances student skills of power and control over delivering a radio interview – while ensuring understanding of programmed knowledge (Revans, 1982) and its contribution to lifelong learning.

A third student complained that it was “Pointless doing the task as it require[d] enormous amounts of information in five minutes with full structured speech which is almost impossible”. Time constraints are an important part of workplace situations; thus their incorporation in this WIL experience helped to ensure its relevance to future real-world encounters (Swart, 2012).

Benefits of the PATS program

In terms of the author’s professional development, the peer assisted teaching support (PATS) program provided its own form of participative action learning process. The PATS project aimed to improve teaching praxis and increase quality learning experiences for students while adding to current research into higher education teaching and situational learning (Lave and Wenger, 1991). From a practitioner perspective, limited challenges were experienced with regard to socio-cultural conflict and technology issues, all being surmountable and aligned with Carbone, Ross, Phelan, Lindsay, Drew, Stoney and Cottman (2014, p. 16) who declared the contribution of PATS to an ‘alignment between teacher’s efforts ...

and student satisfaction with courses'. Consultation with mentor and peers regarding the proposed changes in the assessment design from an MCQ test to a WIL radio broadcast assessment provided the opportunity for academic reflection and sharing of 'ideas in a non-threatening, friendly and relaxed environment' (Carbone, 2014). The PATS mentor provided support and ideas for the development of the new assessment item. While the project was not without difficulties for the practitioner / researcher, the outstanding success of this aspect of the action learning project has been reflected in student feedback on the course, such as the "Big Thank You" mentioned earlier. Thus, the PATS mentoring project provided supportive opportunities that enabled innovation and provision of a quality experience for all.

Limitations of the findings

Some seminal works have criticised action research methodology regarding the contingency of the research findings: low control of the environment and personal over-involvement (Kock, McQueen and Scott, 1997). While more recently Nolen and Putten (2007, p. 406) have pointed to the ethical principles, for example the need for 'informed consent, participant autonomy and the coercive potential of action research'. However, in this third cycle of action research, the triangulation of the qualitative and quantitative results added weight to the findings. This, it is pointed out, is highly desirable for validation of long-term observation of effects (Jick, 1979) and concurs with Altrichter, Kemmis, McTaggart, and Zuber-Skerritt (1990) and is reinforced by Whitehead (2009). In addition, Brannick and Coghlan (2007) make a strong case as to the benefits of such 'insider research'. Robustness was also added to the project by the direction, support and affirmation through the PATS scheme, and as stated by Carbone et. al. (2014)

Work integrated learning (WIL) combined with action research promotes intellectual advancement in a participant's role, as well as providing practical application, cutting-edge engagement and the opportunity for personal reflection on the social process: 'a social system can be more deeply understood if the researcher is part of the ... system being studied', leading to 'information

exchange ... commitment ... and ... organisational development' (Kock McQueen and Scott, 1997 4; Fox, 1990;). A New Zealand study Kahu, Stephens, Leach and Zepke (2013) also found a direct positive relationship between WIL, supportive learning environments (SLE) such as PALAR and student satisfaction.

Lomax (2002, 130) considers researching one's practice as the ultimate expression of what it is to be professional: 'This is in line with those ideals that see action research as a **social process** and not simply a research method ... The new professionalism is premised on a process of continuous professional development ... [leading to] an evidence-based profession' (our emphasis). Zuber-Skerritt (1982, 15) in her early work, established advantages of the framework: 'Through systematic, controlled action research/action learning, higher education teachers can become more professional, more interested in pedagogical aspects of higher education and more motivated to integrate their research and teaching interests in a holistic way. In a much more recent work Zuber-Skerritt (2012, 5) suggests that educators much foster 'creative problem-solving' and 'ignite a flame' for learning – rather than being instructors. She further suggests that this, in turn, can lead to greater job satisfaction, better academic programmes, improvement of student learning and practitioners' insights and contributions to the advancement of knowledge in higher education.'

Conclusion

Adaptation and innovation are at the heart of an educational institution's survival. Universities need to encourage creativity and innovation in all aspects of curriculum design to provide students with quality learning experiences. Swart (2012) also suggests that universities must embed information that can be applied in a work context into all their endeavours, including assessment. This project utilised WIL to help produce work-ready graduates who can respond in a timely manner to the demands of global business.

As demonstrated above, many students' creativity was stimulated by giving them the opportunity to share their opinions and be heard, although this process was challenging for others. PALAR

contributed appreciably to the opportunity of self-directed input into fair assessment outcomes. However, in line with the work of Steffe and Gale (1995), participation in the PALAR experience enabled most students to construct knowledge and reach meaning through not only cross-cultural experiences but also the combination of both personal and cooperative understanding.

In addition, the findings provide evidence of the success of an approach based on 'assessment for learning' (McDowell et al., 2011) and the 'peer-assisted teaching programme' (Carbone et al., 2014). The third cycle of our project demonstrated the effective outcomes of PALAR as recommended by Zuber-Skerrit (2011). Replacing the Week 5 MCQ test with an innovative audio assessment gave students the opportunity to express their creativity and engage in deeper learning. The one socio-cultural project provided both domestic and international students in the PALAR teams a fair opportunity to successfully combine individual and cross-cultural characteristics to build relationships of respect and trust while solving a work-integrated learning challenge facing not only tourism and hospitality students but also all those entering the global workplace. The students demonstrated increased engagement through their ability to shift their learning to a deeper level at which shared opinions promoted greater understanding – a feature missing from the previous MCQ assessment.

The new assessment also encouraged creative cooperation, innovation and use of students' skills, and provided the opportunity for students to find and express their own voice. Their voice, in the form of feedback, contributed further to possible future task improvements. As a direct result of this project, feedback to students on this assignment has evolved into a verbal format that complements the students' efforts in their verbal assessment submissions, as recommended by Hennessy and Forrester (2014).

The combination of the work integrated learning and participatory action learning–action research approaches to course redesign, supported by the peer mentor scheme, provided a sound

foundation for improving both the learning and the teaching experience in this course. Future action research cycles should consider the feedback provided in this third cycle to further adapt this assessment task for increased engagement and deeper learning.

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Biography

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Appendix 1. Marking criteria for the radio interview assessment task

1. Interview response has demonstrated critical application of discipline knowledge and theoretical concepts of international marketing
 2. Response demonstrated extensive knowledge in relation to critical analysis & impacts of global population trends upon global markets
 3. Response demonstrated extensive knowledge in relation to critical analysis & impacts of cultural differences upon international marketing
 4. Response demonstrated critical analysis and impacts with respect to strategic future market opportunities and challenges
 5. Voice was clear and easy to understand. No vocal fillers used (eg. 'like', 'um')
 6. Opened with a compelling attention getter & and closed with an effective summary response to questions
 7. Responses were very professional and demonstrated creative and original responses with a highly confident verbal presence that was clear and effective in getting the message across to a general audience.
 8. Use of recording equipment: demonstrated a high level of professionalism.
-

Source: Measuring and analysing the responses to the new assessment – developed for this project

Strategies for evidencing the Frascatian notion of systematic creative work contributing to the body of knowledge: An example in 'academic' cabaret

Geof Hill

Abstract

Creativity maintains an uncomfortable alliance within research. On the one hand, definitions of research suggest that the process generates 'new' knowledge, while on the other hand, publication of research is imbued with traditions that sometimes discourage difference and creativity. Creative works and specifically performative creative works, following publication of the Frascati criteria (OECD, 2002), are understood to be research. The inclusion of the word 'systematic' in the definition of what makes performative work research may present a hurdle to some creative researchers. While they may acknowledge that their creative work contributes to knowledge, they may also struggle with processes needed to demonstrate systematic development.

Action inquiry and practice-led inquiry are both examples of post-positivist research. Action inquiry is recognised, among other features, by its iterative cycles (Zuber-Skerritt, 1993). Practice-led inquiry is recognised by its instigation in practice (Gray, 1996). Both investigative processes invite documentation strategies that may prove useful in demonstrating systematic development of an inquiry issue. Each of these documentation strategies are relevant for evidencing the research involved in developing creative works.

This paper focuses on cabaret as a particular example of creative research. It illuminates the systematic development of the notion of an academic cabaret using a reflective practice tool of "provenance". Secondly, it demonstrates how utilising cycles in

an action inquiry mode provides evidence of systematic development of an idea. Together these strategies constitute evidence of the research involved in developing, writing and presenting academic cabarets.

Key words

Provenance; creative research; action inquiry; practice-led inquiry; Frascati criteria

Introduction

Can you imagine attending a lecture on say - string theory - and finding that the lecturer was actually explaining this complex scientific concept in a song, the tune of which was recognizable as Queen's 'Bohemian Rhapsody' (Mercury, 1975)¹. It is likely that that would be a memorable learning experience and also likely that when asked questions about 'string theory' you might be inclined to remember some, if not all of what you had heard. While not common, this type of lecture is an example of how creative flair can help to build relationships between entertainment and education. Such connections are the momentum behind the popular 'Bright Club'²

When I became an adult educator, I blended my musical theatre skills, initiated as a teenager in drama school, with my intellectual presentations. My academic pursuits took me from being an industry educator to a university lecturer and subsequently into a

¹ String theory is not one of the topics I address in my cabaret but I thought it a good example as it is so conservative. Timothy Blais created a u tube video in which he does address string theory and this is perhaps a good example of the potential of such communication innovation

<http://www.youtube.com/watch?v=2rjbtSx7twc>

² The 'Bright Club' was established by Miriam Miller (London University College) and Steve Cross (Centre for Life) as a way of bringing research to the theatre stage. The first event was staged in London in May 2009.

<http://www.thejournal.co.uk/business/business-news/smart-people-bringing-work-stage-4424025> accessed January 8th 2015 and has become popular in other countries such as Australia.

twelve-year post-doctoral placement providing professional development around research supervision for university academics. My musical theatre pursuits ran parallel to my academic work and included solo and group singing performances as well as several musical theatre roles and currently cabaret.

As an adult educator, I used songs to emphasize points in the talks, lectures or conference papers I presented. These instances became more frequent, incorporating a conference key-note address with several songs and finally a two-act cabaret, developed through collaboration and delivered as the evening entertainment at a national Experiential Learning conference. By the time I was undertaking my doctoral research, I had delivered my first one-man two-act cabaret on 'Reflective Practice' and wrote and presented another on 'Doing a Doctorate' as one of the publications in my dissertation.

Coinciding with submitting my dissertation containing its portfolio of published works, performance work itself came to be seen as research. The *Frascati Criteria* (OECD, 2002) stipulated that claiming creative or performative work as research required evidence of 'systematic development' of the work. Creative researchers welcomed this initiative in that they had already recognized research processes inherent in the development of creative works (Wilson, 2011). The challenge was in providing the evidence of systematic development.

This paper discusses and models two ways for providing such evidence. The first way applies a notion of 'provenance' to the early development of a creative idea. This process was developed through a practice-led inquiry (Gray, 1996) project that I supervised. It is systematic in that it involves reconstruction through a hindsight plan of reflection. The second way documents the iterations of a creative idea using cycles of action inquiry (Lewin, 1948; Zuber-Skerritt, 1993; Hill, 2014a). Action inquiry is

systematic in that it pursues a 'fixed or methodical plan or system'³ of documentation to illuminate creative work development.

Using cabaret as academic discourse

My idea of academic cabaret involves a spoken monologue around a specific topic interspersed with songs chosen to advance the central theme of the cabaret topic through their lyrics. In several of my cabarets, I open with Sondheim's (1984) 'Putting it together' because its lyrics articulate exactly what I am modelling in my delivery of a cabaret as academic discourse: 'a vision's just a vision if it's only in your head. It has to come to life'. Often my presentations are rounded off with a song, the lyrics of which encourage the audience to pursue their own forms of innovation: 'It's our time breathe it in; worlds to change and worlds to win' (Sondheim, 1981). While these songs could be delivered without accompaniment, my notion of academic cabaret is based on presentation with musical accompaniment.

Initially my cabarets were two-act cabarets and in a break between acts, I encouraged the audience to write rhyming couplets that I incorporated into the first song of the second act. As is evident in this paper, a defining moment in the development of one of my cabarets shifted this tradition, and I now tend to write one-act cabarets that can be programmed in a lecture period or a conference presentation slot, incorporating ample time for questions and feedback.

Providing evidence of systematic development through provenance reflective practice.

Elsewhere (Hill and Lloyd, 2015), I have described Practice-led inquiry as involving practitioners researching their practice in a

³ www.oxforddictionaries.com/definition/english/systematic accessed December 29th 2014

process of action and reflection (Gray, 1996, p. 4)⁴. It is one of a range of investigative approaches emerging from the paradigm debates (for example, Guba and Lincoln, 1982). A typical practice-led inquiry might involve reflection on the inquirer's own prior experiences with the practice being investigated. Supervising other researcher's practice-led inquiries, I coined a term 'personal provenance' to describe this process of reflection that explored the inquirer's own history with the practice they were investigating.

Provenance

The term provenance derives from the French verb *provenir*, "to come from". The Oxford dictionary defines provenance as a noun referring to 'the place of origin or earliest known history of something' and draws attention to its common application in art and antiques discourse where it refers to 'a record of ownership of a work of art or an antique, used as a guide to authenticity or quality'⁵. In the previously referred-to practice-led inquiry supervision, provenance was described as the life story of an item or collection and a record of its ultimate derivation and its passage through the hands of its various owners⁶. Provenance in practice-led inquiry can be thought of as a record of ownership of the professional practice being investigated.

Every practice has provenance. Two forms of provenance are evident in practice-led inquiry: Personal provenance describes the practitioner's personal experience with the practice, and general provenance describes the literature about the practice (Hill, 2013, 2014a, 2014b, 2014d, 2014e).

⁴ Gray (1996) has been described as the 'original and enabling definition' (Haseaman and Mafe, 2011, p. 213) of practice-led inquiry.

⁵ www.oxforddictionaries.com/definition/english/provenance accessed August 12th 2014.

⁶ I am indebted to my colleague Cathryn Lloyd for this particular phrase to explain provenance. The notion of provenance arose in my collaboration with her over her doctoral dissertation undertaken as practice-led inquiry into her own creative professional management practices (Lloyd, 2011)

Personal provenance is a process involving hindsight identification of critical incidents the practitioner identifies as having contributed to their development of the idea or practice that they are investigating. The process is iterative and often begins with identification of one or two identified critical incidents. Each subsequent round of reflection brings to light more detail of already identified incidents and identifies new critical incidents. The process leads to a chronology of events that hypothetically, and in hindsight, informed the inquirer's professional identity (Kemmis, 2010). The chronology can be further systematised developmentally into a proposal for how the investigated practice developed.

Accessing one's history of personal experience has been described in many different ways in the research literature, including 'reflexive ethnography' (Finlay, 2002, p. 536), 'self-reconnaissance' (Dillon, 2008, p. 4), 'reflection on the pre-reflexive consciousness of past experience' (Hauw, 2009, p. 342), 'auto-ethnography' (Marshall, 2011, p. 249), 'fore-having' (Johns, 2010, p. 14) and 'provenance' (Finlay, 2002, p. 536; Hill, 2014a, p. 235; Hill and Lloyd, 2015).

Some critical incidents identified through personal provenance reflection refer to specific literature. This literature posits a starting point for exploring the theoretical frame for the investigated practice or a general provenance of the investigated practice. A theoretical frame can in turn identify reflective lenses (Brookfield, 1998, p. 200) through which the practice being investigated has been viewed or considered. By examining one's personal provenance with a practice an inquirer can examine how problems within the practice have been framed and this helps to identify assumptions that underpin one's understanding of the investigated practice (Marshall, 2011).

One's experience of a practice is thus reconstructed through marshalling incidents and or literature into a frame for understanding the practice. Even though the evolution of the actual experience may not have appeared systematic, making possible connections explicit through documenting this

provenance allows an inquirer to posit a possible and plausible developmental framework. In this sense, it has the effect of a reverse action inquiry.

Using cabaret as academic discourse

My own practice of academic cabaret has operated now for several years. In that time, while I have been advancing the practice, I have also been responding to questions raised by audiences when I presented the cabarets in workshop mode. What is documented here is the end result of brainstorming and systematising it into both chronological and developmental scaffolds as a hindsight proposal as to how events informed each other. I have structured my documentation of provenance in three collections of recollections labelled 'foundation', 'innovation' and 'development'.

Foundation

When I ponder why I ended up developing a notion of academic cabaret, I look to a childhood that was influenced by music, with several members of my extended family being involved in music. As soon as my voice broke, I joined a church choir and later, with members from the church choir, formed a group that sang at weddings. I took singing lessons with Jenny Heaton, the Sydney based singing teacher and sang with a group called Raglan who performed in national television talent quests wearing signature abba-esque costumes. I secured a paid singing spot as a solo performer in a coffee shop/restaurant in Melbourne, Australia and began to explore amateur musical theatre.

In the 1970s, in the context of my professional status as an industry adult educator, I was asked to articulate the benefits of Clerical Work Management (CWM), a Total Quality Management system devised by W.D. Scott, the first Australian management consultancy, for improving work place practices. I used the lyrics from the stage musical *Camelot* (Lerner and Loewe, 1960) in a parody version of CWMalot. This unplanned outcome evolved from circumstances among which I would include my singing

ability and my skill of being able to rewrite lyrics to accommodate my industry agenda.

Later, as a university lecturer in Communication in the 1980s, preparing for an under-graduate lecture on non-verbal communication, I discovered literature that discussed music as non-verbal communication and referred to this in my lecture. The lecture was presented to scaffold the students for an oral presentation assignment. I modelled the espoused theory by concluding the lecture with a parody version of '*Putting it Together*' (Sondheim, 1984) to summarise all of the non-verbal communication ideas that come together to enhance the skills required for an oral presentation.

Innovation

My style of academic presentation, with its signature rendition of a suitable Broadway musical song, became my mode of academic publication. I remember attending a cabaret performed by Judi Connelli, an internationally acclaimed Australian performer, at the Tilbury Theatre restaurant in Sydney. She based her cabaret on her own narrative and as I listened to her story, it evoked ideas and thinking related to my own life experiences. Her sung narrative facilitated my reflective practice (Schön, 1983). This critical incident, in hindsight, may have been the catalyst for my own idea of an academic cabaret and for the theme for my first one-man cabaret. As my career as a university lecturer progressed, I wrote conference presentations that included songs and these experiences culminated in an invitation to be the key-note presenter at an Early Childhood conference (Hill, 1994). My presentation was embellished with several songs.

I collaborated with several musical theatre colleagues to devise after dinner entertainment at an Experiential Learning conference for which I was convenor⁷. The following year, I wrote and

⁷ The Australian Consortium of Experiential Education (ACEE) 1994 Conference in Sydney, Australia.

performed my first one-man cabaret on *Reflective Practice* at the university at which I was undertaking a doctoral degree (Brisbane, Australia) and later performed this to an audience of clients and colleagues in Sydney, Australia. I wrote about those experiences, labelling my communicative innovation 'educational cabaret' (Hill, 2001). My notion of academic cabaret was launched!

Systematic Development

Having established a name for my academic communicative style, I had also created a mental concept storage for ideas related to this. With each successive experience of performing an 'educational cabaret' my thinking about the practice developed. I wrote and performed a one-man two-act cabaret on *Doing a Doctorate*, following encouragement from one of my doctoral supervisors who had attended the *Reflective Practice* cabaret. A printed version of the cabaret was included with other in-candidature publications in my dissertation (Hill, 2002). After graduating, and with motivation and momentum associated with my other cabarets, I wrote and presented a one-man two-act cabaret on *Research Supervision* (Hill, 2006, April), my post-doctoral specialisation, for the International Quality in Postgraduate Research (QPR) Conference in Adelaide, Australia.

The submission of my conference proposal to QPR caused consternation for the conference convenors. Unsurprisingly, they had not previously received a proposal to present a cabaret and needed some guidance as to where to locate it in an international conference. We agreed on a lunch-time presentation so that people could obtain some food and come and listen. With food and wine, the presentation would parallel other cabarets. I had not envisaged that lunch time would also be the time that the conference venue reconfigured rooms and so midway through my presentation, walls were being moved in readiness for the after lunch plenary presentation. Such are the dilemmas of attempting something different from the standard fare. At least the conference convenors entertained the possibility of my innovation. Similar overtures to

other conferences had ended up with an acceptance of the cabaret as a poster presentation. Such offers I did not pursue.

In my preparation for the QPR Conference, I organised a trial run of the full cabaret through my local Action Research network (Hill, 2006, March). This provided something similar to the off-Broadway performance, a common developmental feature of major musical theatre productions, and was presented in restaurant mode with food and drink. The trial run also afforded an opportunity to solicit feedback about my performative work; an essential element in developing a new idea and a parallel to peer-reviewing common in mainstream academic publication.

Following the QPR presentation, I organised a third opportunity to present this creative work by submitting it to a local conference on Effective Teaching and Learning (Hill, 2006, November). This presentation, like the initial trial run, was presented in a venue with food and wine. This matched my close to ideal conditions that were benchmarked on the depiction of cabaret in 'Goodbye to Berlin' (Isherwood, 1939).

The cabaret I wrote for QPR enjoyed three official presentations which gave it an iterative development similar to action research, an issue I take up in the second part of this paper. Each new cabaret similarly created new critical incidents in action research surrounding the idea and added to my experience working with this medium. My ideas about this form of higher education have been shared in a culture of peer-review with an on-line journal article (Hill, 2014c) and a book chapter (Hill, 2014d). Most recently, a different cabaret performed in an international conference in Wales, U.K. (Hill, 2013) was the catalyst for my invitation as key-note speaker at a different international conference (Hill, 2014e). The concept of academic cabaret continues!

How provenance illuminates systematic development of a creative idea.

The practice development in this approach to reflection is propositional connectivity. One can never really prove

categorically that events are connected and impact on each other. What is possible through provenance is to generate a possible and plausible explanation for practice development based on remembered critical incidents. While the practice may not have developed systematically, the hindsight reconstruction of practice development is the result of a systematic process of iterative reflection. That systematic process is evident in several features of personal provenance.

Firstly, an idea needs to have a starting point or point of initiation. This point does not necessarily signify a point of beginning to reflect but it can be seen as a point of commencing action. In my provenance, the single song performed to emphasise the content of a university lecture represents a plausible shift from performing a song, as in a musical production, to using song to advance an argument in an academic terrain. A similar critical incident is the shift in my understanding of the medium from a single song to a collection of songs, and thus a form of cabaret, evidenced in my facilitating the collaborative cabaret. This incident of my facilitating a collaborative cabaret draws attention to how my role as convenor of the conference helped advance the idea. Later I created other opportunities by submitting proposals for conferences. Another critical shift is the presentational venue from local conferences to international ones. As my knowledge of getting a paper accepted grew, I was more successful in having a cabaret accepted for more prestigious conferences.

Secondly, the process of personal provenance highlights the role of reflective practice between different critical incidents leading to the improvement in the situation. This is most evident in writing the proposal in such a way as to increase its acceptance chances. I reflected on my earlier experiences of having a cabaret accepted as a poster session, changed my pitch and became more successful.

Thirdly, undertaking personal provenance draws attention to assumptions related to my practice. For example: my assumption that a lecture or conference paper is about advancing an idea and that this is achieved through an argument. Recognising these assumptions is a starting point for exploring my practice through

critical reflection (Fook, 2010). Looking at the ways in which I am framing the practice can also be considered a form of critical reflection (Argyris and Schön, 1974). My references to Broadway songs situate the practice in musical theatre discourses. The context of higher education situates the practice in a different discourse of higher education pedagogy. The overlap of these distinct discourses defines the possibilities where this practice investigation might make a contribution to the literature and where an investigator could search for other literature about this practice. The references to literature in a personal provenance help to identify literature which may have informed the inquirer's view of their practice. This creates a good starting point for examining the general provenance and literature related to the practice.

The process of personal provenance reveals assumptions I hold about what counts as evidence. For example, my assessment of being a 'good' singer is supported with reference to my singing training, the style of songs I sing and where I have performed. The process also reveals hypotheses that can be explored as the investigation becomes more rigorous. For example, the suggestion that one's childhood exposure to music is a predisposition for musical intelligence can be examined by looking at other practitioners with musical intelligence.

Given that personal provenance is a hindsight process, it's systematic basis is evident in the methodical way by which a practitioner uncovers tacit memories and builds them into a plausible and possible explanation for emergent practice. This method can involve seeking accuracy in the chronology such that a proposition for development can be posed.

Providing evidence of systematic development through documenting cycles of inquiry

In this section I address a second strategy for making explicit the systematic development of a creative idea. An opportunity arose in 2012 to explicitly document and reflect on my experiences of developing and delivering a cabaret in a conference presentation.

That opportunity was initiated by submitting an abstract to a call for presenters for the Inaugural Storytelling Conference in Prague (Hill, 2012). As becomes evident, this initiating event generated several presentation variations of the 'cabaret'.

Action Inquiry

In the wake of Thomas Kuhn's (1962) coining of the term "paradigm", theorists discussed whether scientific method and positivism were appropriate foundations for human inquiry (Guba and Lincoln, 1982). These observations led to a range of post-positivist inquiry paradigms and alternative methods for undertaking human inquiry. One example is Naturalistic inquiry (Guba and Lincoln, 1982). Other paradigms emerged that similarly provided foundations for other alternative investigative approaches of 'Practitioner research' (Stenhouse, 1981; Anderson and Herr, 1999), 'Co-operative inquiry' (Heron and Reason, 1984) and 'Practice-led inquiry' (Gray, 1996). Some of the alternative paradigms use the word 'inquiry' to distinguish them from the paradigm synonymous with scientific method (Reason, 1988).

Arguments advocating alternative investigative approaches resurrected discussion about action research (Lewin, 1948) as a social action inquiry process. This process suggests several steps:

1. Identifying a general or initial idea.
2. Reconnaissance or fact-finding about that idea.
3. Planning, leading into a first step of action.
4. Evaluating the impact of the first step.
5. Amending the plan and leading into a second and subsequent set of steps.

These steps generally outline the iterative cycle for action inquiry. The cycle also has been described in terms of problem identification, action planning, implementation, evaluation and reflection (Zuber-Skerritt, 1993). This description of the cycle emphasizes the change agenda inherent in action inquiry.

A hallmark of action inquiry is making the 'cycles' of the inquiry transparent. The perceived process of iterative cycles provides a useful scaffold to support descriptions of process. Similarly, this device of 'cycles' can be used to show how the idea has been systematically developed to lead to a change in the original issue or problem. An inquirer can document the processes for each cycle and make explicit the ways in which one cycle informs subsequent cycles. These iterations of inquiry parallel Kolb's (1984) model of experiential learning. A dilemma to this form of reporting is that in the effort to show the richness of each cycle and the ways in which the cycles collaborate, there is a risk of being repetitive.

In my documentation of developing a single creative performance I have used the notion of critical incidents in the process as cycles in line with a model of experiential learning (Kolb, 1984) and indicated these in my documentation with a label [] (for example [cycle 1]).

Cycles of Experience and Reflection associated with the development and performance of an academic cabaret

The first critical incident in my creative development journey was a call for papers⁸ for an international conference [cycle 1]. A colleague alerted me to the call that suggested 'abstracts might feature storytelling in any aspect of the culture **including music** (my emphasis)'. I interpreted these criteria optimistically as willingness to accept an academic cabaret. From previous reflection on conference proposal acceptances and rejections, I learned that the abstract or conference proposal is the key element of eventually ending up presenting the cabaret in a conference. The proposal needs to address advertised content themes of the conference. Proposals for a cabaret need to make explicit the

⁸ <http://www.inter-disciplinary.net/probing-the-boundaries/persons/storytelling-global-reflections-on-narrative/conference-programme-abstracts-and-papers/> [downloaded July 25th 2012]

concept of an academic cabaret and explain how such a novel concept might be incorporated into a conference program. My proposal showed how a cabaret would fit one of the advertised themes of the conference. I also provided additional details about how a cabaret might be incorporated into a conference program.

The acceptance on my proposal initiated a new cycle of inquiry **[cycle 2]**. My proposal was accepted with a thirty-minute time limit and fifteen minutes for questions. This was generous compared to other presentations, but it initiated a problem for me in that previously my cabarets had been presented as two-act cabarets. I redefined my notion of conference cabaret from two-act cabaret to a one-act, thus progressing through a critical and defining element of my developmental process. A second problem was posed in that previously all the presentations of my cabarets had been in my local environment enabling me to perform with live accompaniment. I paid my accompanist's airfare and accommodation with interstate conference opportunities. That option was out of the budget considerations for an overseas venture. When I reflected on this problem in the light of earlier presentations of cabarets, for example the single song in an undergraduate lecture mentioned in the earlier provenance, I had been accompanied by electronic music. Technology had improved since that time and I addressed my problem with an Aspire One notebook with Logitech speakers to amplify music that I pre-recorded on a USB. The notebook was small and convenient for overseas travel and it doubled as my main communication device to remaining family in Australia.

Aside from the two problems already mentioned, I approached the writing of this cabaret using previously established strategies. I draft an overall argument for my paper and then brainstorm the songs that would embellish the particular elements. Choosing the songs involves not only a choice of appropriate lyrics but consideration as to whether I can perform the song. For example, a popular song on classical radio when I was writing this cabaret was the Ten Tenor's song 'Here's to the heroes', with lyrics written to be accompanied by the 'John Dunbar theme' from 'Dances with

Wolves' (Barry, 1990). It is an emotion charged song and this fitted some of the agendas for my proposed cabaret. But, this song was unsuitable for a solo performer.

My writing development led me to a draft cabaret of **[Cycle 3]** five songs connected by monologue. I started rehearsing this script with my accompanist making sure that the songs worked as individual performances and the overall presentation conformed with the time I had been allocated. I had the accompaniments recorded and began rehearsing the performance, tweaking the monologue with iterative rehearsals. In undertaking this cycle, given a heightened consciousness about the way in which I develop a cabaret, I wondered whether other cabaret performers work this way. The approach is similar to the way I develop a conference paper. The only additional factor is that I have to consider whether I can sing the songs that come to mind that might fit this particular topic or developing discourse/argument.

The period of rehearsal and writing culminated in a performance of the draft cabaret to an audience of friends - what I describe as an Off-Broadway performance **[cycle 4]**. Presenting a performative work to an audience for the first time opens it up for feedback. In this particular cabaret, conscious of the very tight 30 minute time line, I timed the work to the minute. Some of the feedback I received from friends and family was that the work was too tight, and in the effort to get through the material I was going too fast. This resulted in some editing of the overall text.

Soon after presenting an off-Broadway version to friends, I flew to Europe in the lead up to the conference. In the two weeks before the conference, I was staying at an isolated location with limited transport. Without distractions, I found that I rehearsed the draft work every day **[cycle 5]**. This was a new element in my rehearsal regime and somewhat like a dramatic work for which, close to opening night, the actors rehearse the play in its entirety. This rehearsal invited more familiarity with my 'script'. As a presenter, I developed a chatty and relaxed delivery style. The repetitive rehearsal also reduced my anxiety level about the timing of this presentation.

I presented the work [cycle 6]⁹. From the applause and the comments from peers in the aftermath, it appeared the cabaret was well received, although through a miscalculation of timing of not allowing for my chair's presentation speech, the overall work was cut short. I did have the opportunity after the discussion of the paper to come back to the final song and present that. A fellow presenter, Raelene Bruinsma, a fellow Australian and also PhD student, presented her work 'An Invitation To The Sacred Wedding Of Inanna and Dumuzi' in a performance of 45 minutes. This presentation provided a realistic contrast by which to reflect on my own presentation. She had negotiated a longer time. Her cabaret style was different. I often described my cabaret style as a 'Broadway' type cabaret because its repertoire was predominantly Broadway musical songs. Her presentation had an earthiness and rawness in presentation, accentuated by her self-accompaniment with a range of instruments. It was closer in style to the original Berlin cabaret.

Reflection time following the formal presentation of my cabaret was limited because of an impending subsequent presentation, but, by reflecting on her presentation I could see ways to make my own more fluid and could see the advantages of a slightly longer performance space.

I had planned a visit to the Academic Writing Centre at Europa University in Frankfurt-on-Oder, Germany immediately following the Prague conference [cycle 7]. The purpose of the visit was ostensibly to experience their model of academic writing, and in a spirit of sharing ideas, I presented my cabaret to the staff at the centre. The atmosphere on this day was much chattier and more relaxed than it had been in Prague, and I was not constrained by a strict time sequence. I found that my presentation became more fluid.

⁹ with <http://www.inter-disciplinary.net/probing-the-boundaries/wp-content/uploads/2012/04/What-happens-when-a-student-wants-to-do-something-different-in.pdf>

My visit to Prague for the conference had been scheduled within a broader sabbatical to Coventry University Academic Writing Centre and when I returned from the conference, continuing the spirit of sharing, I presented my cabaret to a group of staff and interested colleagues at the centre [**cycle 8**]. In the interim, I had decided that I could add an additional song which I had used in a different cabaret and for which I needed no additional accompaniment. Again, the atmosphere was more relaxed and I was able to present my cabaret within an overall 60 minute presentation. This allowed more time for questions and relaxed the pace, shifting the cabaret from a monologue or lecture to a catalyst for dialogue.

A call for papers for a regional Higher Education Authority (HEA) during my Coventry University sabbatical provided a fourth opportunity to represent this work. The Head of the Writing Centre at which I was undertaking my sabbatical was billed as the key-note speaker for the HEA colloquium. My abstract was accepted and following participant registrations, was scheduled as a single strand. It appeared on the program as a closing key-note speaker. I partially rewrote the cabaret for this new audience [**cycle 9**] to accommodate feedback from previous iterations that my ideas applied more generally to all research rather than specifically to dissertation publication. Following the HEA presentation, one of the members of the audience made a comment that when I had begun my cabaret performance by immediately starting to sing he feared a bad karaoke example. As the presentation progressed, he recognised that I was modelling the very argument I was making and demonstrating an alternate way of presenting academic writing. He concluded with complimentary comments indicating that he had been won over during the course of the presentation. His use of the term 'won over' gave some credence to my belief that a conference paper is the presentation of an argument and that my argument for alternative ways to present a conference paper had been effective. I believed that his feedback articulated a response often not articulated by people in my audiences when they see this form of presentation for the first time. I had sensed in my various presentations an enthusiasm for difference and

creativity, and his comments affirmed this. I believe that this momentum was a key factor in subsequent invitations to present it again at Birmingham City University.

It was almost twelve months before I returned to the UK and presented at Birmingham City University as part of a three-university tour to Birmingham, Coventry and Brighton. In response to feedback from previous iterations that suggested that my ideas applied to all research not specifically to dissertation publication, I changed the title of the cabaret. The additional song I had added in the post-Prague presentations remained and provided a vehicle to talk about new paradigm research and its complicit agenda of new forms of research publication. The performances at these universities represented from my point of view three subsequent cycles [**cycle 10**, **cycle 11**, **cycle 12**]. Their close proximity allowed a new momentum to develop between performances that mimicked a mainstream theatre production on tour. The cabaret was presented at Birmingham City University as part of a ½ day colloquium that also included a jazz band [**cycle 11**] as an alternative example of publishing one's research differently. The tour affirmed for me the body of interest in incorporating creative work into research publications.

Returning from this tour, and strengthened by my cabaret's popularity at these international venues, I submitted the cabaret for the Quality in Postgraduate Research (QPR) Conference, a conference at which I had previously successfully presented a cabaret on *Research Supervision* (Hill, 2006). I rewrote the cabaret substantially and renamed it in line with the conference theme [**cycle 14**]. The cabaret proposal was accepted and I negotiated a pre-conference (off-Broadway) presentation in the Education faculty of my own university [**cycle 13**]. This cycle afforded an important technological aspect of the delivery of my cabarets. This particular cabaret had started with solving an accompaniment problem using computerised music. By the time the cabaret was presented at QPR [**cycle 14**], with the assistance of the conference technology assistant, I had a more sophisticated accompaniment technology using music tracks attached to PowerPoint slides. This

simplified initiating the music at various points in the cabaret and thus gave more energy for presenting.

What makes this action inquiry?

The documented cycles of inquiry related to this creative work make evident how the original cabaret written for the Prague conference [cycle 3] developed into the cabaret presented at QPR [cycle 14]. The content changed to accommodate the different audiences. The framing of the content shifted to accommodate the different presentation contexts. My skills in presenting academic work this way benefited both from audience feedback and comparison with a peer working in similar media.

Each time a cabaret is performed represents publication of that work. The cycles of inquiry highlight the multiple publications associated with this work. Sometimes in addition to the vocal publication, post-conference publication of conference papers facilitated additional written publication of the various cabarets. Publication is a key element of research as it exposes the work to peer-review. The cycles of presentation show how feedback from earlier publications was incorporated into revisions of the work. The repetition of published works, as evidenced in the reference list for this paper, is a signifier that rather than talking about this idea, the idea is advanced through action or practice.

One of the developmental themes evident across these cycles of action inquiry is the shift around the cabaret accompaniment. In the early iterations and particularly the provenance, I performed my cabarets with live accompaniment. In this series of iterations, the problem of accompaniment is solved with technology, and that technology becomes more sophisticated as the cycles progress. By the final cycle, the cabaret is presented using accompaniment tailored to a PowerPoint slide. This technological change also changed the ways in which I rehearse the cabaret as I no longer needed to rehearse with my accompanist, but could do so almost daily, as I did, in the lead up to the first presentation. This change in rehearsal changes my relationship with the material and hopefully made the cabaret more relaxed and sociable. Although

this development may seem to be a purely technical issue, these cycles of inquiry demonstrate how practice changes in its relationship to technology.

¹⁰A second development theme relates to the capacity and role of creative works to be a way of doing and publishing research. The paradigm debate generating new paradigm research brought with it a complicit agenda of new forms of research publication. One common example of this is the shift in the research tradition of writing in the third person to suggest objectivity, to writing in the first person (Somekh, 1995). My cycles of inquiry related to publishing this cabaret not only explore how a creative work might be developed, but they also bring to light some of the issues associated with publishing creative work in performance, such as time allocation and suitable venues.

The cycles that I have nominated in this action inquiry are arbitrary. A different inquirer might suggest that what I describe as a single cycle in which I rehearsed the performance several times is for them, several cycles. My choice to have this as one cycle is because over the repetitive rehearsals I observed only minor changes. Had I documented more intently I may have noticed more significant changes and created more cycles. The value of a device such as 'cycles' is that it helps to make explicit the ways in which one event influences and contributes to another. If I had not contributed at the HEA regional conference I would not have received an invitation to perform at Birmingham City University. Each new audience increases the number of people who as peers are providing peer reviews.

One of the benefits of using Action Inquiry is that by making explicit both the problem and ways in which one has solved the problem, factors in developing a creative idea are illuminated. It opens the description of practice. Research is about solving problems as you go. In some forms of research, the problems are

¹⁰ I am grateful for the feedback from reviewers to this paper that alerted me to this developmental theme.

hidden. There is benefit in being able to document the research process and show how problems have been solved along the way as this highlights the problem solving nature of the process. Sometimes the solution to a problem is short term, such as the way in which the problem of accompaniment was solved; whereas the timing problem represented a problem that was tweaked throughout multiple cycles.

Action inquiry also opens up new questions about the practice. For me, questions such as 'how do other cabaret performers write, rehearse and perform their work?' and 'How do the audience understand this marginalised form on academic discourse?' are questions which contribute to deepening understanding of the practice. They enable the detail and the inner workings of a practice to be documented and the connections between different elements of the work to be made explicit. The two questions open up the practice to additional aspects of benchmarking – comparing to literature and critical reflection to ascertain the assumptions and beliefs underpinning the work.

Conclusion

The act of documenting, both through provenance and action inquiry is time consuming but rewarding. Often, a practice unfolds without even the practitioner being aware of the many aspects that inhabit the practice. The advantage for other practitioners is that they get to see or read the inner workings of practices that often are mystical or beyond explanation. When you can compare your own practice to that of your peers there is the advantage of seeing different ways to tackle the same problems. Before you can compare your practice to others, you need an increased insight into your own. This form of practice investigation benefits both the practice and the practitioner.

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Biography

Geof Hill is the principal consultant of The Investigative Practitioner, a management consultancy focussed on supporting professional practice investigation. Geof has held university lecturing positions at UTS Sydney (Kuring-gai College) and Macquarie University (School of Early Childhood). He was the Co-ordinator of Research Supervision Professional Development at Queensland University of Technology for twelve years.

Geof currently works as a senior researcher with Birmingham City University, Faculty of Health, Education and Life Sciences. He is investigating business professionals' use of reflective practice and reflexive practice using practice-led inquiry. He has performed multiple cabarets on Reflective Practice, Doctoral Research and Research Supervision and has been a keynote presenter at several international conferences.

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


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