Chapter Twelve
Taking Stock -
A Reprise of Findings

With many thanks to
NRICH, 'Peter'
and all other AskNRICHers

Doing Mathematics in Different Places: an Exploration of Young People's Activities as they make Independent Use of a Web-Based Discussion Board

Libby Jared
PhD Thesis

King's College London
Supervisor Dr Mary Webb

Each chapter has been edited to enable it, as far as is feasible, to 'standalone'.

The chapter numbers and numbering of sub-headings has been left unchanged from the original Thesis.

However, each edited chapter has its own page numbering and any cross-references *within* the chapters and *between* chapters on the NRICH website use these (new) page numbers followed by specifying the page number(s) in the original Thesis chapters.

Where appropriate, references may be given to other chapters (not included on the website) within the full Thesis, either by specifying the Section or providing the Thesis page number(s).

If in a chapter reference is made to any appendices, then the relevant appendix is attached at the end of that chapter.

Each chapter has its own list of references.

[The Thesis title, abstract and acknowledgement pages together with a table of contents for these edited chapters and glossary from the Thesis are also included. The table of contents of the full Thesis appears after Chapter Fifteen].

Dr Libby Jared
October 2014

Taking Stock - A Reprise of Findings

I feel that my mathematics improves by learning from other people's solutions and methods and being able to organise my thought into a method/proof that is comprehensible by other people.
[AskNRICHer aged 14, 2010]

12.1 Introduction

The previous four chapters [Eight to Eleven] have reported on the analysis and findings of an in-depth exploration of AskNRICH using the three Perspectives. The purpose of this brief interlude chapter is to:

i.   take stock of the many findings reported separately in the four previous chapters through three diagrams illustrating a wholistic overview of the AskNRICH artefact

ii.   indicate the directions taken in the remaining chapters that lead to defining a characterisation of AskNRICH, building on the findings already established

The chapter begins with the three diagrams [Figures 12.1, 12.2 & 12.3] presenting different aspects or levels of detail of the wholistic view: methodological, identified features and theoretical underpinnings respectively. The second part outlines the steps taken to produce a final characterisation of AskNRICH.

12.2 Diagrammatic Overview of Findings

The diagram in Figure 12.1 below depicts the interconnections (blue double-headed arrows between ovals) between the particular sets of threads chosen for the three Perspectives, in essence portraying their synergies and complementarities. The diagram also shows the five identifiers of the summary tables of features (Feature Catalogues) provided at the end of each of Chapters Eight to Eleven. Black double-headed arrows are used in order to emphasise the interwoven nature of inter-connections between the features in the five catalogues. The red double-headed arrows depict the further inter-connections between the three Perspectives and the five Catalogues.
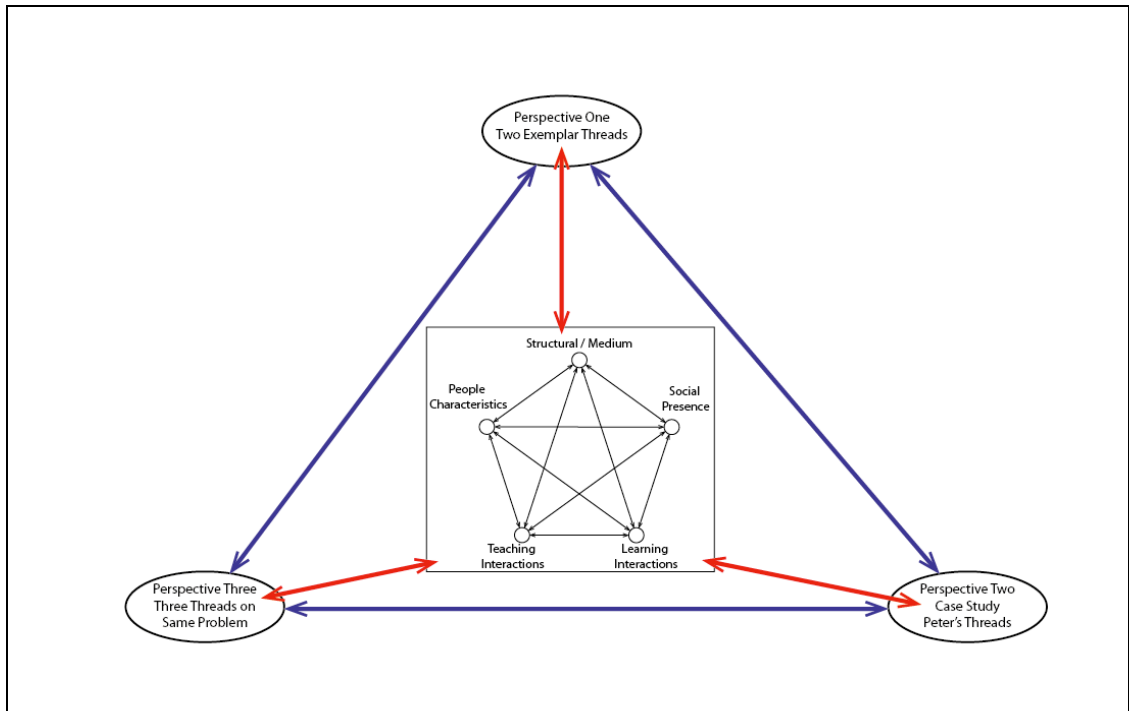
Figure 12.1   Diagrammatic Representation of Interconnections between Perspectives and Features

Figure 12.2 [next page] is a copy of the completed version of the diagram built up through Chapters Eight to Eleven setting out the features and illustrating their interwoven interrelationships. It shows each table with its identifier with a listing of all Features within and thus can be seen as an expanded view of the inner box of Figure 12.1.

As in Figure 12.1, in Figure 12.2 the double-headed arrows on the pentagon indicate the inter-dependence between the Features in the Catalogues. Explanations and discussions around each of the features shown in Figure 12.2 are contained in the individual Chapters [Eight to Eleven].

Structural / Medium

Open to all
Unrestricted / unlimited time for study
Asynchronous sequencing
Content led by participants
Posting protocols bedrock
Ethos and etiquette
Serious place to pursue interest
Lurkers (silent note takers)
Ebb and flow of participation

People Characteristics

Love of subject
Common Interest
Usually higher achieving
 (in the subject)
Pro-active in own learning
Persevere
Empathy/soulmates
Polite and respectful
Emulating mathematicians' traits
Strong metacognitive skills

Social Presence

Banter/Humour
Friendly chit-chat
Everyday conversations
Free expression
Social grace

Teaching Interactions

Designed by the posting protocols
Subject Content in response to
 individual enquiry
Avoidance of giving solution
Adept in a range of teaching strategies
Scaffolding strategies adopted
Contingent responses
Opportunities to develop both subject
 and personal skills
General Advice offered
Broadens the learning experiences

Learning Interactions

Guided by the posting protocols
Multiple motives for seeking help
Current progress indicated
Proof pursued
Evaluation of solution(s)
Invoking deep/relational understanding
Opportunity to experience how others
 work mathematically
'Tools' for the Mathematician's Toolbox
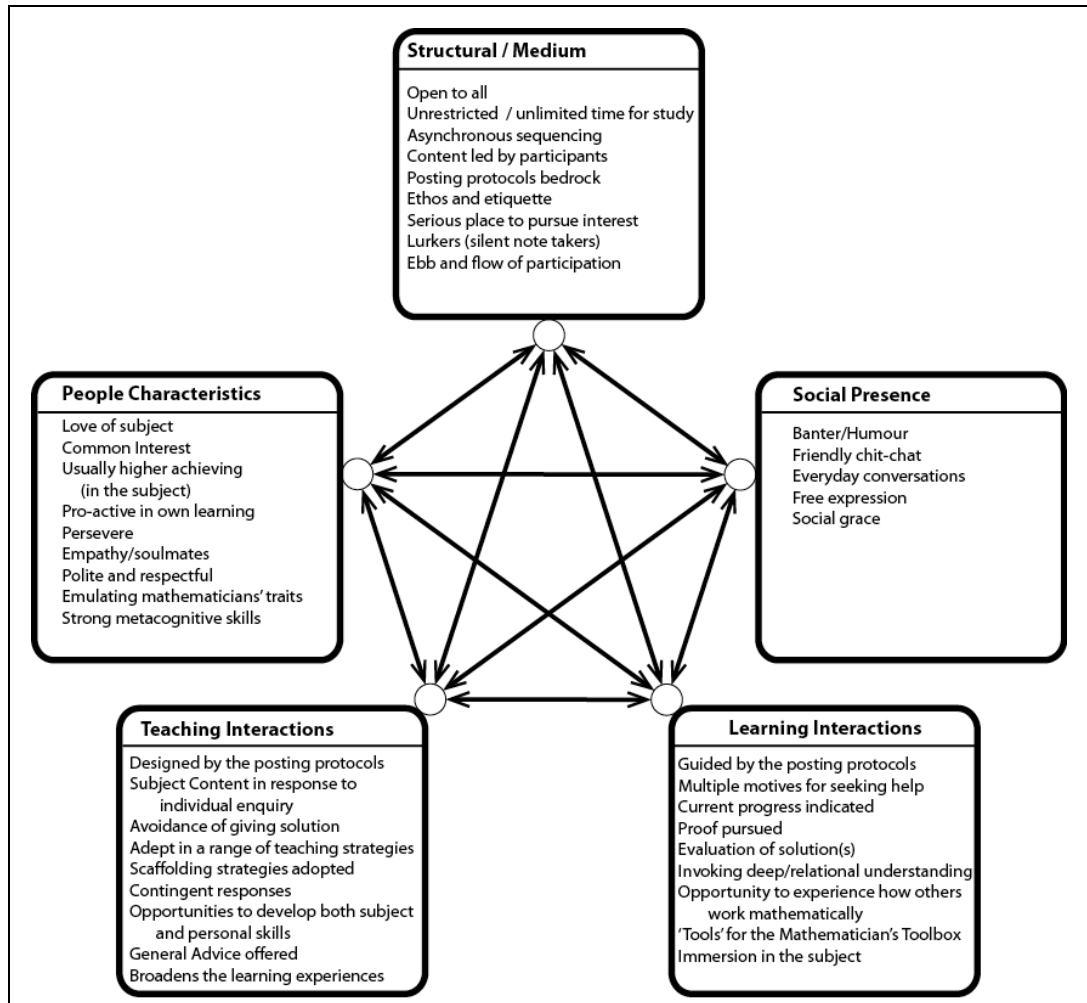Immersion in the subject

Figure 12.2 Detail of Figure 12.1 listing Features in each Summary Table

Figure 12.3 [next page] shows, visually, the five theoretical underpinnings used in reporting the three Perspectives. The relationship between these underpinnings and all the interconnected Features depicted in Figure 12.2 is portrayed by superimposing a transparent layer listing those underpinnings over the depiction of Perspectives and Feature Catalogues of Figure 12.1.
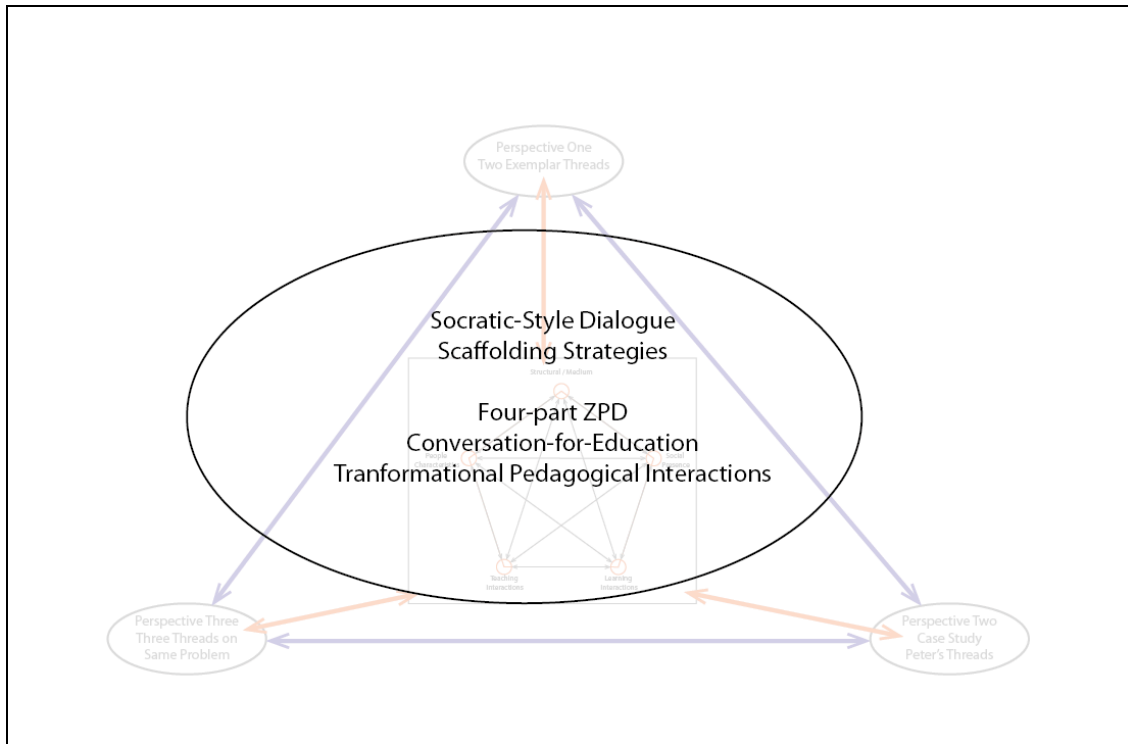
Figure 12.3 Theoretical Underpinnings used in Reporting the Exploratory Examination

Reflection focusing on the five underpinnings depicted in the topmost layer of the diagram in Figure 12.3 leads to a realisation and affirmation of the pivotal role of the Posting Protocols in shaping the nature of AskNRICH. Two Protocols, in particular, are revealed as crucial: firstly, the entreaty to the helper i.e. 'teacher' to provide hints and guidance not a solution, and, secondly, the onus put on the 'learner' to share current thoughts and ideas. These two Protocols have the immediate consequence of establishing a Socratic-Style of Dialogue that permeates the threads, leading to the adoption of scaffolding strategies [Chapter Nine] and providing the opportunity for conversation-for-education [van Lier 1996: 167] [Chapter Eleven]. The opportunity for this type of conversation is further enhanced by the freedom with which the AskNRICHers can participate in contingent conversations [van Lier 1966: 175] in both a teaching and learning role. In turn, when this conversational style exists it clearly matches the upper levels of van Lier's transformational pedagogical interactions [van Lier 1996: 179]; all content on AskNRICH is determined by the AskNRICHers themselves. Chapter Ten revealed that '*teaching but learning*' was an important aspect of Peter's activities in a helping role. He sometimes entered a thread in a helping role, but subsequent interactions provided him with the opportunity to also increase his own learning. John [Chapter Eight pp13-14/Thesis p174] provides a complementary

example of teaching but learning in which the helper knows the topic but finds out that they have gained a greater understanding of it through helping the learner. '*Teaching but learning*' interactions such as these ensure the opportunity for intermental activities to forge intramental capabilities [Vygotsky 1978: 57]. Thus, whatever their experience, AskNRICHers may, at different times, be working within different parts of van Lier's [1996: 194] proposed four-part ZPD model.

12.3 Outline of the Remaining Stages: Defining the Characterisation

At this point in the thesis narrative the Exploratory Examination of the AskNRICH Artefact and the part of Exploring and Defining the Characterisation of AskNRICH have been presented. Building on these foundations, in the remaining chapters of the thesis the final characterisation was defined through a consideration of the arguments, touched on in Chapter One, for viewing AskNRICH in terms of a (virtual) space in which to meet and collaborate.

[For presentation on the NRICH website, the next chapter describes the Characterisation of AskNRICH that was developed in stages [described in detail in Thesis Chapter Fourteen] through further consideration of the collaboration and cooperation between the AskNRICHers combined with the appropriation and modification of Gee's [2004, 2005] concept of an Affinity Space].

References

Gee, J.P. (2004). *Situated Language and Learning: A critique of traditional schooling*. Abingdon: Routledge.

Gee, J.P. (2005). Semiotic social spaces and affinity spaces: from *The Age of Mythology* to today's schools. In D. Barton & K. Tusting (Eds.), *Beyond Communities of Practice: Language, Power and Social Context* (pp. 214-232). Cambridge: CUP.

van Lier L. (1996). *Interaction in the Language Curriculum: awareness, Autonomy & Authenticity*. Harlow: Pearson Education.

Vygotsky, L. (1978). *Mind in Society: the development of higher psychological processes*. Cambridge MA: Harvard University Press.