

Evaluation of Learner Profile Attributes and Competencies in South Australian International Baccalaureate (IB-MYP) Students

Final Report

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I. BACKGROUND AND OVERVIEW

The purpose of this Executive Summary is to report findings from three completed research studies conducted at IB schools in Adelaide, South Australia.

In 2010, researchers at Flinders University were approached by a group of South Australian schools offering International Baccalaureate programmes in primary years (PYP) middle years (MYP) and/or at the Diploma level (DP). Representatives from these schools expressed an interest in investigating outcomes for students and teachers of participation in IB programmes. In particular, these staff wished to explore the extent to which some of the characteristics and competencies associated with the IB philosophy and curriculum framework may be evident in their students, and ways that the IB programme may also impact teachers' work.

After a series of discussions between Flinders researchers and school personnel, an initial set of three small research studies was designed and commenced. Funding was successfully obtained to support this research through a Flinders University EHL Faculty Project Grant and a Jeff Thompson Research Award obtained by the participating schools. The initial group of schools involved in developing the research project were:

- Salisbury High School
- Blackwood High School
- Belair Primary School
- Direk Primary School
- Rose Park Primary School
- St. Andrew's School

At the end of 2010, Direk Primary School closed as an independent entity and underwent a merger. The principal, Robyn Ravalico, relocated to North Haven Primary School and this school has since replaced Direk as a partner. After attendance at the initial meetings, Rose Park Primary School withdrew its participation, citing other priorities, while St. Andrew's School underwent a change of leadership and did not participate in planning meetings. As a result of these changes, the initial Primary Schools component of the project, investigating teachers' planning within the IB programmes, was delayed and then significantly reduced. In 2012, after the other three components of the project had been completed, contact was re-established by Flinders University researchers with Belair Primary School, and it was decided to commence a scaled-down version of this component of the project. As a result, Flinders University has employed a Research Assistant who has recently completed data collection and analysis at Belair Primary School, and these results will be reported to the school within the next month.

Findings from Research Studies 1 and 2, as reported below, were shared with participating schools in 2010 and 2011, and shared with local school representatives at the Flinders Educational Futures Research Institute (FEFRI) conference in 2011. Interim results from Study 3 were shared at the Flinders IB Symposium in 2012. The results from Study 3 were unable to be finalised until Flinders researchers were provided with data from the schools related to participating students' final Personal Project scores in August, 2013. Multiple changes to IB personnel within the schools created challenges in maintaining the flow of information from previous years. However, all data have now been collected and analysed for that component of the research, and findings can now be reported. Flinders researchers are currently working on a manuscript related to this project, to be submitted for publication to an international peer-reviewed journal.

Research Studies

The broad purpose of this research was to investigate outcomes for students participating in the International Baccalaureate (IB) programme. More specifically, the research explored the extent to which students participating in the IB programme in the target schools demonstrated a selection of the characteristics articulated in the IB Learner Profile (LP) and the skills reflected in the Approaches to Learning (ATL) component of the IB curriculum framework. Since the LP and ATL represent core components of the IB curriculum framework, it was agreed that the investigation of student characteristics and competencies should focus on these descriptions. Three studies were designed as follows:

Studies 1 and 2: A comparison of students with and without prior IB experience, on characteristics described in the IB Learner Profile and Approaches to Learning

This study involved year 8 students attending Salisbury High School and Blackwood High School. Students who had completed the PYP and/or MYP (first 2 years) were compared in terms of their approaches to tasks in Maths (Study 1) and Humanities (Study 2). Students' responses were examined in relation to four characteristics or attributes of the IB Learner Profile: (a) Open-minded; (b) Thinkers; (c) Reflective; (d) Inquirers.

Study 3: A comparison of students with and without prior IB experience, in their approaches to the IB Personal Project

Participants for this study were Year 9/10 students attending Salisbury High School and Blackwood High School. This study was designed to compare students who had completed the PYP/MYP in primary school with those new to the MYP in secondary in their approaches to the Personal Project, which is a hallmark piece of work within the IB. Students' approaches were examined primarily in relation to the Learner Profile attributes of: (a) Inquirers; (b) Reflective; (c) Thinkers; (d) Inquirers. Data for this study included students' work samples and interview transcripts at two points in time; one during the early planning stages of their project work, and one after the completion of their projects.

The following sections of this document summarise findings from Studies 1-3.

II. DEVELOPMENT OF THE “APPROACHES TO LEARNING PROFILE”

In order to evaluate the extent to which students displayed characteristics and attributes reflected in the LP and ATL, researchers developed a list of “codes” against which to analyse individual responses. Since it merges aspects of the LP and ATL, this list was dubbed the *Approaches to Learning Profile* and is included in Appendix A.

It was agreed in the initial research meetings that the LP areas of (a) Open-minded, (b) Thinkers, (c) Reflective, and (d) Inquirers would be the focus of analysis. An initial list of codes or indicators was developed by researchers from relevant descriptions in the LP and ATL documents. While some of these descriptors were too broad to enable analysis of an individual response, others were overly specific. There was also a degree of overlap between many of these descriptors. An initial revision of the list enabled researchers to address some of these concerns. The revised list of codes was then used independently by four researchers to analyse two transcripts of two students. Through discussion of this

process, the list was further refined, with some categories removed and others merged and/or condensed. At this stage, a number of new codes were added to the list to capture students' responses. Codes were organised under the themes of Inquiry, Thinking, Reflection, and Openness. Thus, the coding protocol was simplified by combining the two documents, LP and ATL, into the *Approaches to Learning Profile*. The transcripts for Studies 1, 2 and 3 were coded for analysis using the new 'Profile'.

The following descriptive codes were added to the original list by the researchers to reflect processes evident in student responses:

Inquiry:

I5 Defines key terms related to the inquiry

I19 Identifies helpful mentors (parents, friends, teachers, neighbours, relatives)

Thinking:

T13 Checks the result of a step or move in the problem solving process

T 24 Explicitly ignores information

T25 Generates a product, either as a step in the solution attempt or as a final answer

T26 Elaborates an idea by adding detail

Reflection:

R3 Identifies current and developing interests in relation to learning

R7 Identifies relevant Area of Interaction

Openness:

O5 Describes more than one point of view in relation to an issue

Themes and sub-themes in the *Approaches to Learning Profile*

The *Approaches to Learning Profile* (ATLP) combines elements of the Learner Profile and Approaches to Learning which are used to guide IB curriculum planning. The sub-themes shown below highlight the main concepts within each theme.

Inquiry

ATLP descriptors (codes) were organised into sub-headings as shown in Figure 1.

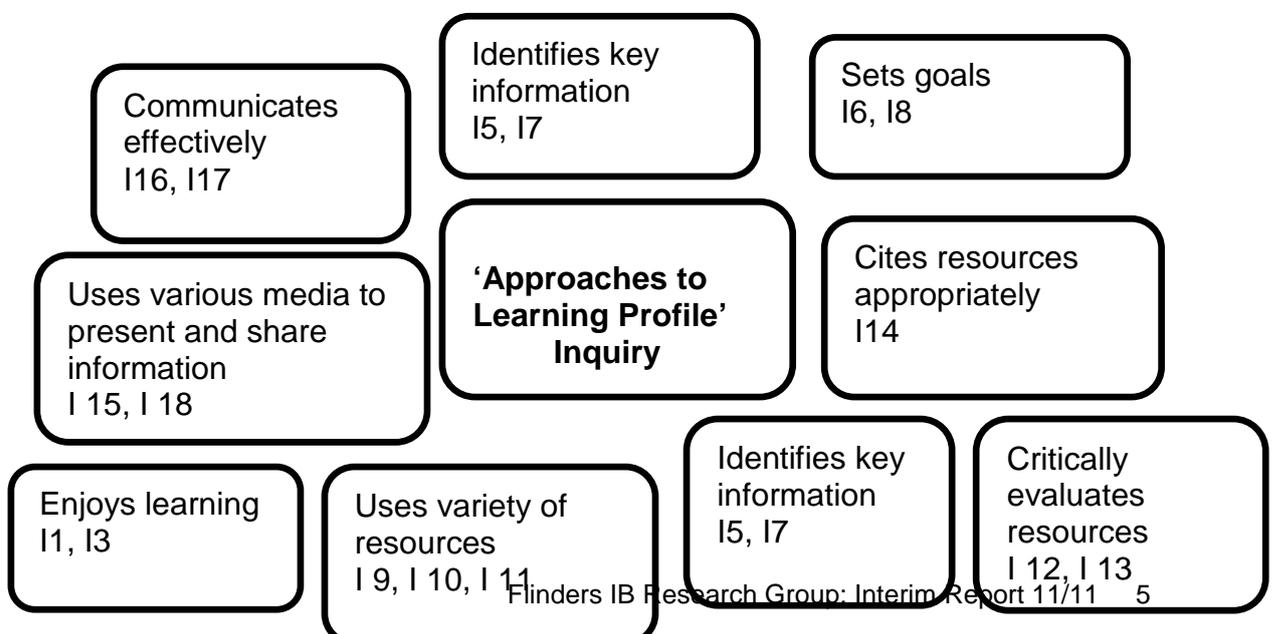


Figure 1. Sub-themes in Inquiry

The sub-themes in Inquiry clarify the process of inquiry as involving the identification of key information, goal setting, recording and citing resources appropriately, identifying key information, evaluating resources critically, enjoying learning, being able to use various media to present and share information, and communicating effectively.

Thinking

ATLP descriptors (codes) were organised into sub-headings as shown in Figure 2.

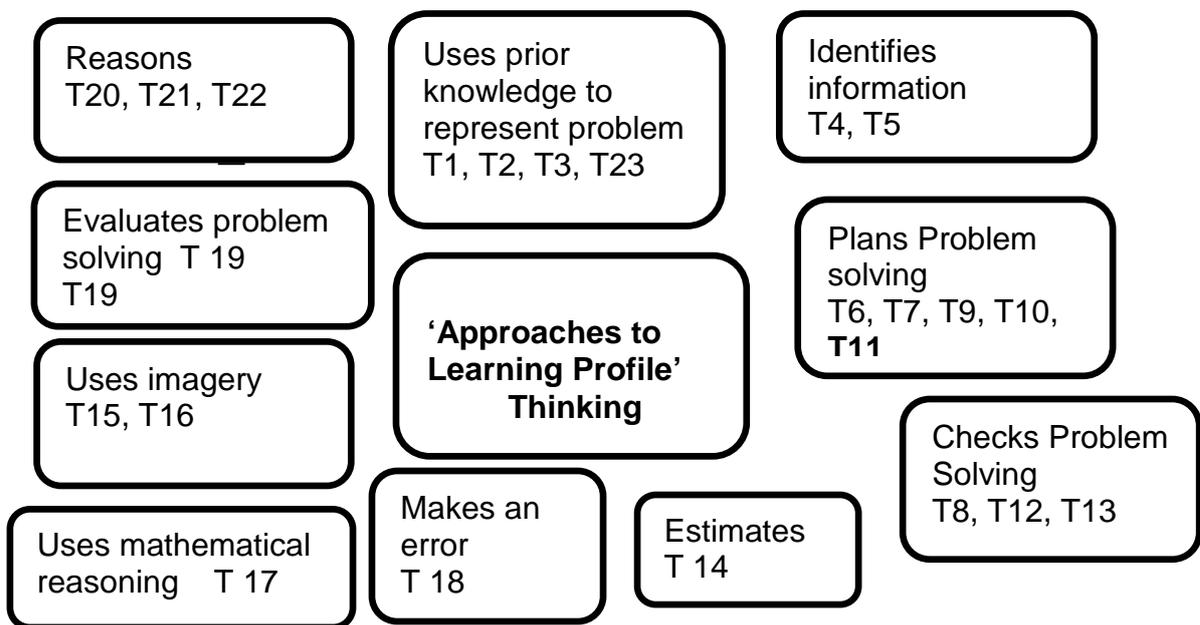


Figure 2. Sub-themes in Thinking

The sub-themes in Thinking clarify the process of thinking as involving the use of prior knowledge to represent problems, identifying information, planning problem solving, checking problem solving, estimating, making errors, using mathematical reasoning, using imagery, evaluating problem solving, and reasoning.

Reflection

ATLP descriptors (codes) were organised into sub-headings as shown in Figure 3.

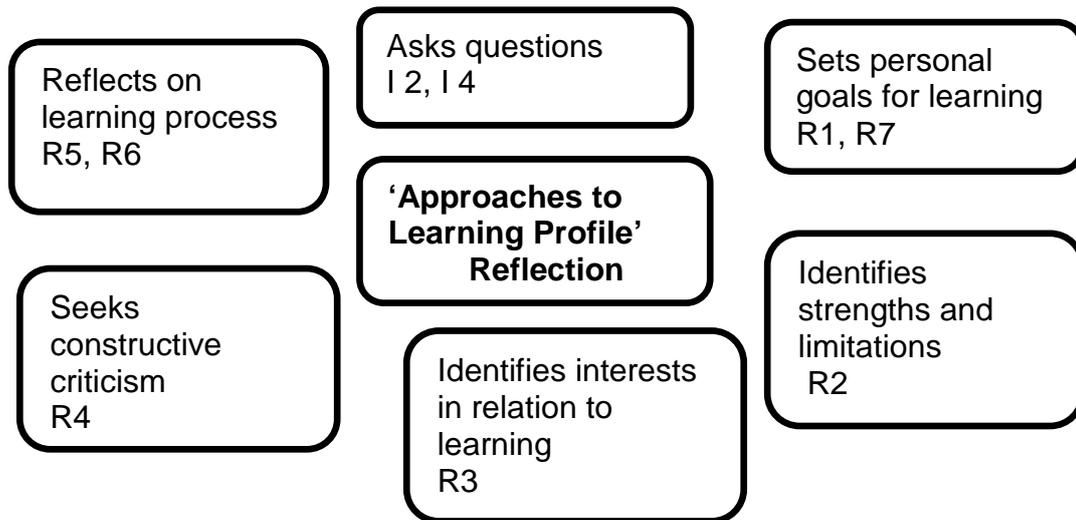


Figure 3. Sub-themes in Reflection

The sub-themes of Reflection describe the process of reasoning as asking questions, setting personal goals for learning, identifying strengths and limitations, identifying interests in relation to learning, seeking constructive criticism, and reflecting on the learning process.

Openness

ATLP descriptors (codes) were organised into sub-headings as shown in Figure 4.

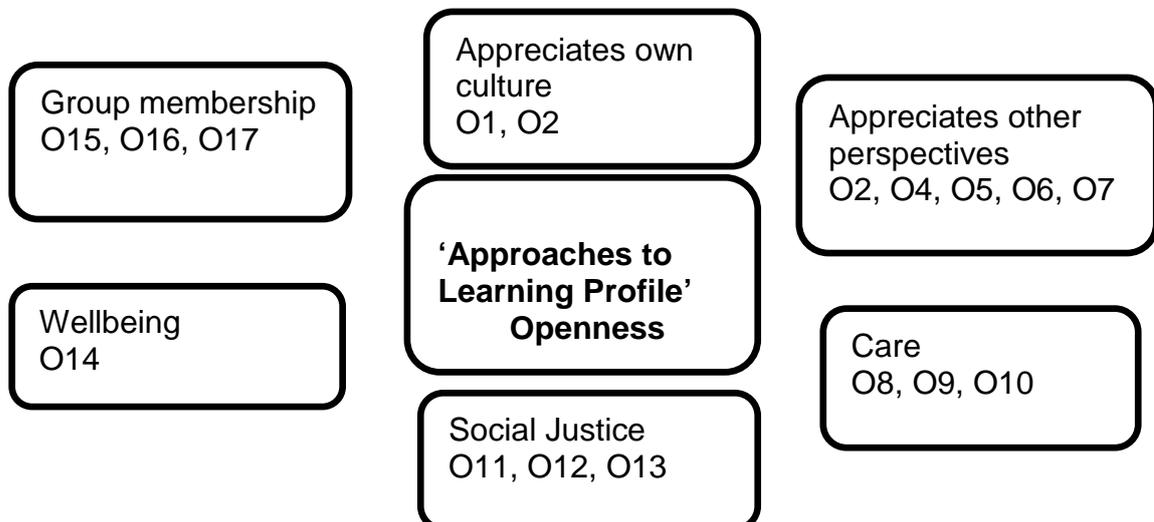


Figure 4. Sub-themes in Openness

The sub-themes in Openness clarify this set of characteristics and processes as involving appreciating one's own culture, appreciating other cultures, caring, concern for social justice, wellbeing, and identifying as a group member.

In this research, the *Approaches to Learning Profile* document was used effectively to code students' responses to tasks related to Humanities and Mathematics as well as questions about their work on the Personal Project. The ATLP articulates specific descriptors that represent the kinds of reasoning and work reflected in the ATL and LP documents. In this way, it may be a useful tool to guide teachers in their planning, teaching and assessment within the IB curriculum framework.

III. REPORT ON IB YEAR 8 MATHS PROBLEM SOLVING (Study 1)

The Problems

Three maths problems related to geometry were presented to students after consultation with teachers. The simplest problem was presented first, followed by the next most complex problem, and then the most complex (See Appendix B).

The Think Aloud Interview

The researchers interviewed 12 Year 9 students and presented them with the three tasks (prompts). Of the students, 6 were new to IB and 6 had previous IB experience. Students were asked to think aloud as they worked on the problems. After training in using the think aloud procedure they worked through the problems. When a student was silent for a short time (about 3-5 sec), he or she was reminded to “Keep talking” or “Keep telling me what you are doing now”.

In the first part of the work on each problem students were not required to explain what they had just done, or why they had made a particular move, but simply to try to give us an ‘on line’ report on what they were doing. After they had indicated that they were finished with the problem in this way, we asked them to “Tell us what you did to work out that problem”.

The first of these reports is designed to show what is being done in the student’s working memory close to when it is happening. The report after the problem has been finished allows for reflection and may also be subject to some rationalising.

Analysis Stage 1

For each student we had a verbatim transcript prepared from the taped interview. The transcripts were then coded according to the ATLP document (See Appendix A). The codes used in the analysis of these transcripts are listed in Table 1 below.

Each transcript was divided up into units, where a unit was concerned with a specific code. The result of the solution attempt was also noted as being correct or incorrect. For both Problems 1 and 2 the possible scores were 2 (correct) and 1 (partially correct). For Problem 3 there were 6 different angles that needed to be identified so the possible score for this problem was 6.

Analysis Stage 2

The coded transcripts were then examined to identify two types of actions, productive and less productive actions. Coding was completed by raters who did not know the group membership of students as having previous experience with IB or being new to IB.

Productive actions

Actions that can be regarded as good quality problem solving actions were identified as Productive. These productive actions are ones that have been identified in both the IB documents and the research on problem solving as ones that can help a student move productively toward a solution, even if that solution is not correct. Most of the codes in Table 1 describe productive actions.

Less Productive actions

Less Productive actions are ones that involve an error, or an action that is unlikely to move the student toward a solution. You will see that a small number of these actions are highlighted in Table 1.

Table 1. Codes used in analysis of mathematics problem solving

Thinking	
T1	Generates ideas, including through the use of techniques such as brainstorming
T2	Retrieves relevant knowledge from long-term memory to help understand a problem
T3	Identifies key elements or information in a presented problem
T4	Re-reads all or part of a problem to aid understanding
T5	Draws or elaborates a diagram or visual representation to aid understanding of a problem
T6	Devises a plan for working towards a solution
T7	Articulates questions in relation to a problem
T8	Self-corrects an error in problem solving
T9	Identifies a specific strategy for problem solving
T10	Switches to a different strategy
T11	Breaks down a problem into sub-problems
T12	Pauses problem solving to self-check for understanding
T13	Checks the result of a step or move in the problem-solving process
T14	Applies an estimation strategy/guesses
T15	Uses mental imagery
T16	Applies analogical reasoning to understand a problem
T17	Employs mathematical calculation
T18	Makes an error
T19	Evaluates own progress or solution
T20	Makes an inference
T21	Reasons ethically towards a solution
T22	Justifies or explains own beliefs
T23	Makes meaningful connections across instances or discipline areas
T24	Explicitly ignores information
T25	Generates a product, either as a step in the solution attempt or as final answer
T26	Elaborates an idea by adding detail
Reflection	
R1	Sets (articulates) personal goals for learning
R2	Identifies and reflects on own strengths and limitations
R3	Identifies current and developing personal interests in relation to learning
R4	Seeks constructive criticism
R5	Reflects on own learning process
R6	Employs tools such as learning journals and portfolios to monitor and reflect on own learning

With regard to Code T14 it is appropriate in much problem solving, and would be in this problem solving, to use an estimation strategy. However, in the problem solving observed here the nature of this problem solving is better described as unchecked estimation or guessing. This typically involved the student in making an estimate about the size of an angle and then accepting that estimate as the actual size of the angle, without any further use of important information provided in the problem statement. The neglect of the provided information is not likely to move the student toward a possible solution. An example of this type of unchecked estimation is:

So that one would be lower, so that would be about 100 degrees, this one would be smaller than that as well, so that one would be like 80, this one would be ... degrees, that one would be smaller too, so that would be like 60 degrees.

In this analysis of Productive/Less-Productive actions we did not include some of the codes in Table 1 because they did not identify these types of actions and so would not provide information that would distinguish between students. The codes in this group were;

T17: Employs mathematical calculation

T22: Justifies or explains own beliefs (this was very common and did not discriminate)

T25: Generates a product

Results

Productive-Less Productive profiles

Table 2 presents the results for the analysis of the Productive/Less Productive profiles for the students at each school. The numbers in Table 2 represent the proportion of the students' actions that were rated as Productive.

For each of the schools two sets of numbers are presented. One set shows the proportion of Productive actions taken in the first stage of the think-aloud interview when the student was reporting without being required to give an explanation of the reasons for the action. The second set of numbers show the proportion of Productive actions for the total interview, including both stages of the think-aloud interview.

It can be seen in Table 2 that there was a wide range of performance across the student group. Generally the students found it difficult to generate appropriate solutions. Student 2 from SHS generated very good solutions.

Group comparisons

Comparison of the groups of students with previous IB experience and those new to IB in Year 8 did not reveal a consistent difference in level of Productive problem-solving action in either school. The mean level of performance of the new students tended to be slightly higher though we do not regard this difference as being of practical significance. Perhaps the finding of most interest at a broad level is that in this small sample of students the level of productive problem-solving action did not differ between the groups.

Productive action sequences

For most of the students there was a reasonable proportion of productive action identified within IB literature and the research on problem solving. For some students the proportion of such thinking in their interviews was very high even though they did not generate a correct solution. In most cases such a pattern of performance was associated with lack of critical mathematical content knowledge, such as the relationship between types of angles. Yet though a student might lack this critical content knowledge they could still make productive moves that are identified in the Learner Profile and Approaches to Learning.

Examples of sequences of such productive action using the code labels in Table 1 included:

SHS Student 4 Problem 3: T4→T9→T1→T3→T13→T1

SHS Student 3 Problem 2: T4→T4→T3→T3→T3→T19→T7→T3→T3→T5→T5→T15→T2

BHS Student 1 Problem 2: T7→T3→T2→T9

BHS Student 4 Problem 2: T5→T3→T13→T12→T10→T19→T10→T3

In these sequences we see students generating actions that are likely to move them closer to an appropriate solution. They are inspecting the given information, accessing their existing knowledge, drawing or elaborating diagrams, checking the results of a particular move and their progress toward the solution.

Table 2: Productive action profiles and problem-solving scores

Student	Group	Proportion of productive moves made in Stage 1 of think-aloud interview	Proportion of productive moves made in total think-aloud interview	Problem-solving scores (Max=2-2-6)
<u>School A</u>				
	<u>Previous IB</u>			
	S1	0.35	0.49	0-1-0
	S2	0.73	0.75	1-1-2
	S3	0.75	0.65	0-0-0
	<u>Mean</u>		<u>0.58</u>	<u>0.63</u>
	<u>New to IB</u>			
	S4	0.85	0.75	0-0-0
	S5	0.45	0.49	0-1-0
	S6	0.64	0.62	0-0-0
	<u>Mean</u>		<u>0.65</u>	<u>0.62</u>
<u>School B</u>				
	<u>Previous IB</u>			
	S1	0.42	0.40	0-0-0
	S2	0.84	0.84	1-2-6
	S3	0.80	0.73	0-1-0
	<u>Mean</u>		<u>0.69</u>	<u>0.67</u>
	<u>New to IB</u>			
	S4	1.0	0.95	0-0-0
	S5	0.74	0.74	0-0-0
	S6	0.48	0.51	0-0-0
	<u>Mean</u>		<u>0.74</u>	<u>0.73</u>

Less Productive action sequences

As noted above, the most common difficulty experienced by students was activation of mathematics content knowledge relevant to these problems. Where this knowledge was not activated, or was not available, students often resorted to a type of ‘estimaths’. Although use of these strategies is reasonable in the absence of critical knowledge they were associated with frequent and compounding errors. So the estimation that one angle ‘looked about 60’ then influenced the estimation of other angles. An example from BHS Student 1 working on Problem 3 shows this pattern;

T3→T14→T19→T9→T14→T25→T18→T25→T18→T14→T14

The initial estimation (event 2) was followed by use of different estimation strategy and the generation of a product that was incorrect, then another of these estimation-product-error sequences.

Discussion

This was a small scale study. We did not observe a strong trend for students with more experience in the IB to show more productive problem-solving action. However, we do not see this outcome as indicating that the previous IB experience does not confer an advantage on students in their mathematics. The small scale of the study was useful as a first foray into this field and suggests that the effects of the previous experience are likely to be complex and subtle and so deserve more detailed investigation. It is relevant to note that the existing records in the schools will warrant further study. The students in the current sample have quite varied backgrounds and this will have contributed to the pattern of results observed here. The use of this more detailed background knowledge from existing records with the much larger samples available in both schools is likely to be quite informative.

IV. REPORT ON IB YEAR 8 HUMANITIES RESPONSES (Study 2)

Background

Students who have studied the IB MYP at primary school (Years 6-7) might be expected to have an understanding of inquiry and aspects of the Learner Profile (LP) and Approaches to Learning (ATL). However, students without prior IB experience may have less understanding of inquiry and aspects of the LP and ATL. It could be hypothesised that students without prior IB experience would demonstrate less evidence of these elements in responding to relevant problems.

Think Aloud Interview

The researchers interviewed 24 Year 9 students and presented them with two tasks (prompts) related to the area of Humanities. Of the students, 12 were new to IB and 12 had previous IB experience. The tasks were developed by collaboration between school staff and the researchers (See Appendix C).

Students were asked to approach the prompts as though they were planning out an essay about the topic. They were asked to think aloud as they worked on the tasks. After training in using the think aloud procedure they worked through the tasks. When a student was silent for a short time (about 3-5 sec), he or she was reminded to “Keep talking” or “Keep telling me what you are doing now”.

In the first part of the work on each task students were not required to explain what they had just done, or why they had made a particular move, but simply to try to give us an ‘on line’ report on what they were doing. After they had indicated that they were finished with the task in this way, we asked them to “Tell us what you did to work out that task”.

The first of these reports is designed to show what is being done in the student’s working memory close to when it is happening. The report after the task has been finished allows for reflection and may also be subject to some rationalising.

Students’ responses to both tasks were audio taped. The audio tapes were transcribed and then coded by one researcher according to the sub-themes of the ATLP (See Appendix A). Inter-rater reliability was checked by having four transcripts coded by another researcher. The level of agreement was high between the two raters.

Analysis

A researcher rated each interview transcript in terms of the overall quality of the response to the Humanities issues discussed. The ratings were: 0=poor, 1=good, 2=outstanding. Each transcript was coded according to codes in the ATLP themes of Inquiry, Thinking, Reflection, and Openness.

Results

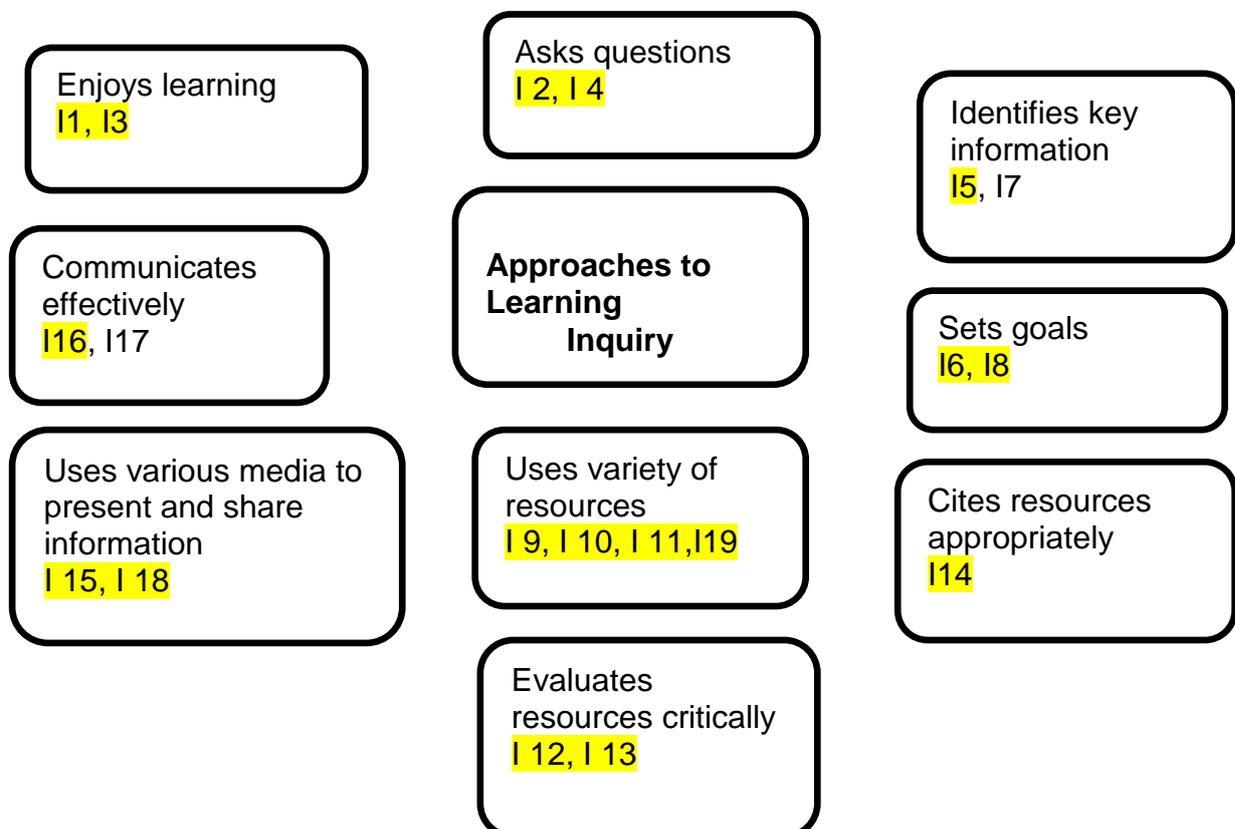
The study compared students with and without prior IB experience on characteristics described in the ATLP. The results for the whole sample are shown below in relation to the codes for each sub-theme of (a) Inquiry, (b) Thinking, (c) Reflection, and (d) Openness. This is followed by a comparison of codes used by students new to IB, and those with IB experience across the two schools. The comparison between these groups was inconclusive, so the general results are more meaningful for their implications for teachers.

a) *Inquiry*

Student responses to both humanities tasks showed that only one code was used:
I17=communicates ideas and information confidently.

The following Inquiry codes were not used by students (highlighted in boxes below):

- I-1 Demonstrates natural curiosity
- I-2 Shows independence in learning
- I-3 Actively enjoys learning/ shows love of learning
- I-4 Poses questions for research and inquiry
- I-5 -Defines key terms related to the content of inquiry
- I-6 Articulates goals for task completion
- I-7 Organises task information and resources
- I-8 Shows effective time-management for completion of task
- I-9 Seeks information from a variety of sources relevant to the task
- I-10- Uses a range of technologies to gather information
- I-11 Identifies and seeks information from both primary and secondary sources
- I-12- Identifies potential bias in sources
- I-13 Synthesises information from multiple sources
- I-14-Appropriately cites and references sources
- I-15-Describes sharing information with others using a variety of media
- I-16 Communicates understanding and information in ways that are both novel and effective
- I-18-Demonstrates effective presentation skills in sharing information with others
- I-19 Identifies helpful mentors (parents, friends, teachers, neighbours, relatives)



b) Thinking

The following thinking codes were used by students:

T1 (7 students) Generates ideas, including through the use of techniques such as brainstorming

T2 (7 students) Retrieves relevant knowledge from long term memory to help understand a problem

T4 (8 students) Re-reads all or part of a problem to aid understanding

T6 (6 students) Devises a plan for working towards a solution

The following thinking codes were not used by students (highlighted in boxes below):

T8-Self corrects error in problem solving

T13-Checks the result of a step or move in the problem solving process

T14-Applies an estimation strategy

T15-Uses mental imagery

T16-Applies analogical reasoning to understand a problem

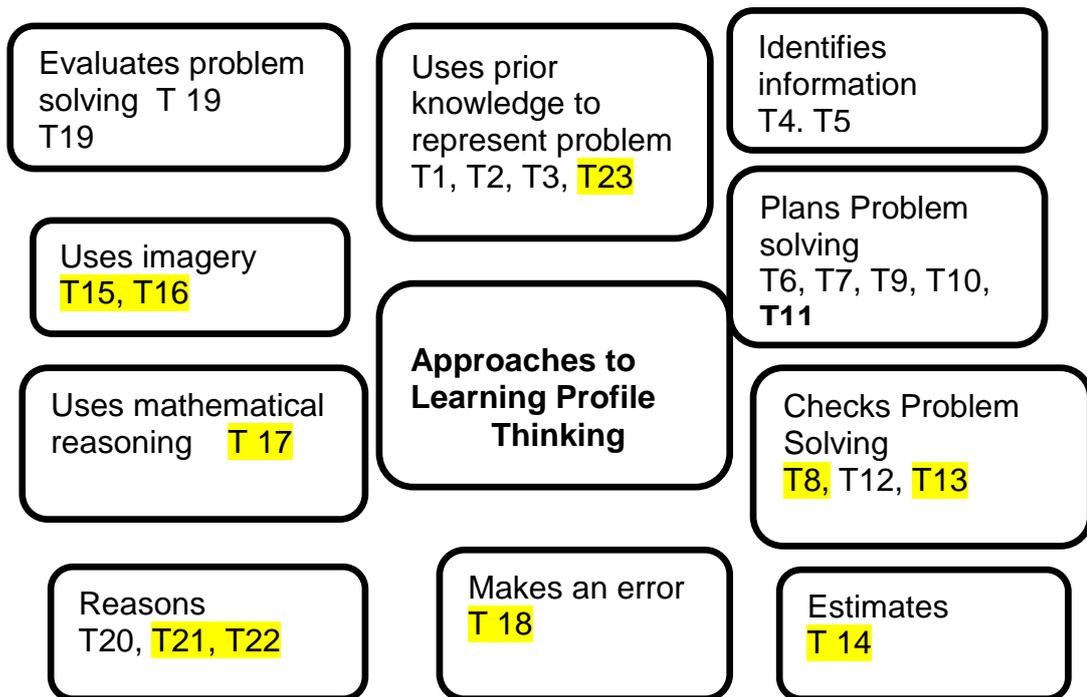
T17-Employs mathematical calculation

T18-Makes an error

T21-Reasons ethically towards a solution

T22-Justifies or explains own beliefs

T23-Makes meaningful connections across instances or discipline areas



Student responses coded in thinking indicated that students used prior knowledge to represent the problem, identified relevant information, planned an answer to the question/issue presented and evaluated their progress toward a solution.

c) Reflection

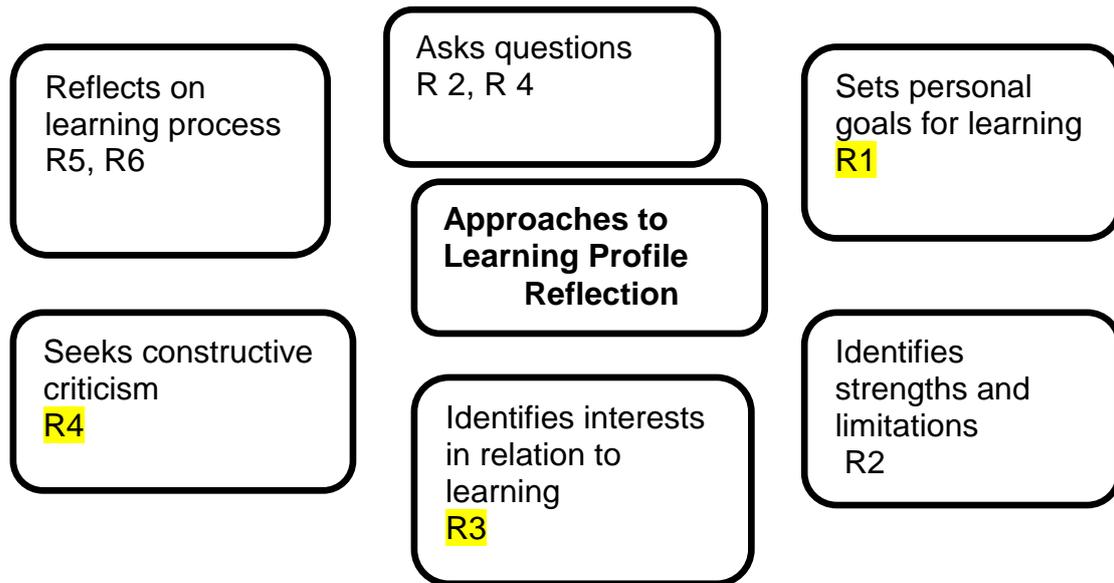
Student responses showed that code R5 (6 students) reflects on own learning process was used most frequently.

The following codes were not used by students (highlighted in boxes below):

R1-Sets (articulates) personal goals for learning

R3-Identifies current and developing interests in relation to learning

R4- Seeks constructive criticism



Student responses to both humanities tasks showed that three reflection codes were used but R2 and R6 were only coded once. Six students used the code which indicated that they reflected on their own learning process.

d) Openness

The following openness codes were used by students:

O3 (9 students) Displays openness to the perspectives of others

O5 (7 students) Describes more than one point in relation to an issue

O8 (10 students) Shows empathy, compassion and respect towards the needs and feelings of others

The following codes were not used by students (highlighted in the boxes below):

O7- willingness to grow from experience of understanding diverse perspectives

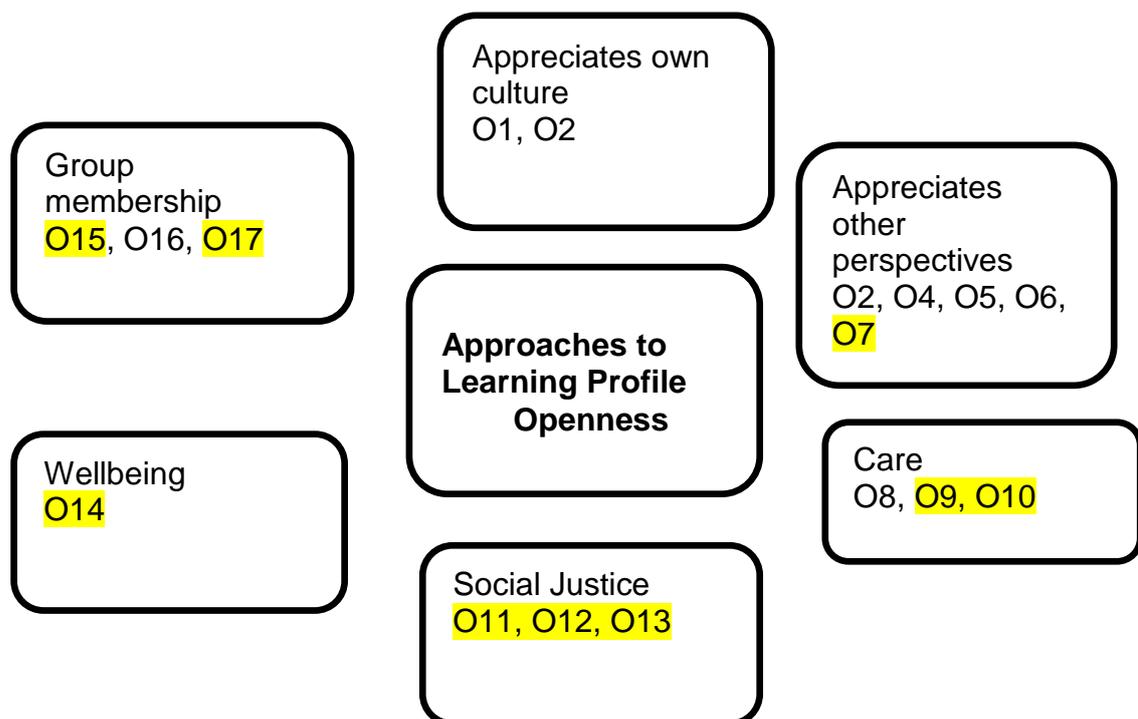
O9-demonstrates personal commitment to service

O10-identifies need to make positive difference to lives of others

O14- articulates importance of intellectual, physical and emotional balance to achieve personal wellbeing for self and others

O15-describes working effectively in groups, including adapting to roles and taking on responsibility as a group member

O17- describes negotiating goals with peers and teachers



Student responses to both humanities tasks showed that some students displayed openness to the perspectives of others, described more than one point of view in relation to an issue, and showed empathy, compassion and respect towards the needs and feelings of others.

Group Comparison

Table 3: Response ratings by group for the two humanities prompts

Students New to IB		Students with IB experience	
<u>School A</u>		<u>School A</u>	
Student	Response Ratings	Student	Response Ratings
S1	1-1	S4	1-1
S2	2-2	S5	1-0
S3	2-2	S6	1-0
<u>School B</u>		<u>School B</u>	
Student	Response Ratings	Student	Response Ratings
S7	0-0	S10	0-0
S8	1-1	S11	2-1
S9	2-2	S12	2-2

As noted previously, we did not find a conclusive difference in the overall ratings of students' responses to the humanities prompts based on prior experience with IB programmes. Ratings for each of the two responses for each student are shown in the Table 3 above. In comparing students who achieved a high rating for their responses in comparison to those that did not, we found a trend towards greater use of productive problem solving strategies for those with higher ratings, or at least a tendency to report the use of these strategies in greater detail. For example, students who achieved higher ratings for their responses were more likely to apply and/or report strategies such as brainstorming, drawing on information from long-term memory to help understand the problem, using imagery to explain their ideas, and spending time planning their response. In the most effective responses, students also carefully weighed both sides of an issue, although some students who gave less-developed responses gave a surface-level mention of multiple perspectives. While students with higher ratings appeared to have greater awareness and use of productive problem solving strategies, it may be the case that this difference reflects the better general language and communication skills of these students rather than meaningful differences in thinking or inquiry skills. That is, these students may have been better able to articulate and explain their approach to the task. This is a question for future investigation.

Discussion

This was a small scale study. We did not observe a strong trend for students with more experience in the IB to show clear differences in the approach they took to the humanities problems. However, we do not see this outcome as indicating that the previous IB experience does not confer an advantage on students in their humanities work. As with the maths study, the small scale of the study was useful as a first foray into this field and suggests that the effects of the previous experience are likely to be complex and subtle and so deserve more detailed investigation. It is relevant to note that the existing records in the schools will warrant further study. The students in the current sample have quite varied backgrounds and this will have contributed to the pattern of results observed here. The use of this more detailed background knowledge from existing records with the much larger samples available in both schools is likely to be quite informative.

The comparison of approaches to the humanities problems for students with IB and those without IB was inconclusive. The codes used by students could indicate aspects of the ATLP that the students have learnt well, and it was the case that all students demonstrated attributes and competencies espoused by the IB. The codes that were not used could provide indications to teachers of areas needing further classroom discussion. Teachers could plan to incorporate explicit discussion related to these codes into their teaching.

V. REPORT ON IB PERSONAL PROJECT STUDY (Study 3)

Background

A cornerstone of the International Baccalaureate's Middle Years Programme is the Personal Project, a substantial piece of independent inquiry completed by students predominantly during their fifth year, which is the equivalent of Year 10 in the Australian school system. However, there has been little explicit research into the nature of the inquiry process undertaken by students as they work on this project. In particular, the extent to which students demonstrate and develop attributes and competencies articulated in the IB Learner Profile and the Approaches to Learning components of the IB curriculum framework has not been comprehensively explored.

The purpose of this research was to examine how students in two secondary schools conceptualised, planned, and reflected upon their work at various stages of the personal project, and how their thinking and inquiry processes reflected the attributes and competencies embodied in the IB framework.

A further purpose was to compare students with previous experience in the IB programmes with those new to IB, in their approaches to the Personal Project. Students who have studied the IB Middle Years Programme at primary school (Years 6-7) could be expected to have an understanding of inquiry and aspects of the Learner Profile and Approaches to Learning. However, students without prior IB experience may have less understanding of inquiry and aspects of the Learner Profile and Approaches to Learning. It could be hypothesised that students without prior IB experience would show less evidence of elements of the Learner Profile and Approaches to Learning in their discussion of their preparations for the Personal Project, and their reflections on the final project.

Participants and Method

This project included 24 students (12 female, 12 male) from the two secondary schools. In each school there were 6 students who were new to IB and 6 students who had had previous IB experience. These students were in their final term of Year 9 when they were interviewed about their initial planning for the Personal Project, and they were in their final term of Year 10 when they were interviewed at the completion or near completion of their projects.

Each participant was interviewed on two occasions at their school by one of five university researchers (see Appendix D). The first interviews were conducted throughout Term 4, after participants had been introduced to the Personal Project by their teachers and had undertaken initial generation of ideas and plans. Participants were individually asked questions about their ideas for the project, the resources they had consulted, and the work they had completed so far; each researcher worked from a common protocol in conducting a semi-structured interview. It was explained to participants that they would be invited to engage in a second interview once they had completed or almost completed the project.

We conducted the second round of interviews approximately one year later. In this interview, students were asked about the final product or response they had developed for their Personal Project. They were also asked to reflect on the process of working on their projects throughout the year.

We also examined students' marks awarded for their Personal Projects, which enabled some comparison of approaches between students who had been successful and those who had

experienced less success in the assessment of their final products. However, while the final marks received from Blackwood were based on internal assessment, those received from Salisbury were externally moderated. This made it difficult to directly compare the two sets of marks. However, we were able to engage in some comparison of more successful and less successful students within each group.

Analysis of Interviews

For each student we had a verbatim transcript prepared from the taped interview. The transcripts were then coded according to the ATLP document (See Appendix A), which aided in the analysis. Two researchers independently coded the full set of transcripts, while a third researcher coded a subset of transcripts. This enabled the researchers to check for consistency in the use of codes, and a number of coding revisions were made based on comparison between the three researchers. Through an iterative process of examining, categorising and re-categorising the codes, key themes were generated regarding students' approaches to planning their projects, and we were able to identify frequently occurring codes within each category. Some general results are summarised below.

Selecting and defining a topic, and planning the project

Transcripts 1 (planning) and 2 (reflection) were inspected to identify the reasons given for students' selection of their Personal Project topic. We were particularly interested in the extent to which students would describe their topic in terms of a core inquiry question or goal, such as those outlined in the IB Personal Project guide (e.g., '*Examine how local environments affect poverty in my city and write an essay to present my findings.*').

At the time of the first interview, three students had not yet identified a topic, and a number of students had already changed their topic multiple times. In examining students' responses, we found that the large majority (over 80%) initially described their project according to a "product" focus, by naming something they intended to make or produce, as reflected in this student's response:

Well, I am making a skateboard, the wood part of it, and I am going to be doing like artwork on the back of it.

When asked about the goal of his Personal Project, the same student replied:

Well, I would just like to get it done on time; get good marks; learn stuff during it and gain skills from it.

This and many similar responses suggested that students tended to define the purpose or goal of their projects in general terms, rather than in terms of a strong guiding question or goal. We also found that many students had difficulty defining the question/s their project intended to address, and some seemed confused about what a research or inquiry question would be. In addition, just over half of the students had difficulty articulating the IB Area of Interaction addressed through their project, and in some cases students were unable to name the options. Some students who did identify the AOI suggested that this had been selected retrospectively to fit their topic, rather than guiding them to investigate and develop a topic.

When explaining why they had selected a particular topic, the majority of students explained their choice in terms of personal interests and skills, or its relationship to future career pathways. Others indicated that they had chosen their topic based on available resources, such as access to mentors, venues or equipment outside of school.

More than a third of the students described the initial planning phases of their project in an instrumental way when they outlined the practical steps they would take to begin the project. For example:

Well so far we've like organised, like what we're making, the project name, what materials and what we'll be needing. How much it will cost if we're to do something big and that and also we're starting to write up about it, a bit of an introduction.

These comments reflect the student's approach to planning as an instrumental, step-by-step practical process, and also suggest a product orientation to the Personal Project. Few students discussed planning in terms of examining and refining a central question, or collecting and reviewing information in order to help them further define their topic; that is, the process tended to be explained in instrumental terms rather than as a process of engaging in inquiry.

Reflecting on their project and experience

We identified a number of consistent themes in students' responses in the post-project interviews. Almost half of the students reported changing their topic since we had spoken with them in the initial planning stages.

The majority of students referred to motivation in their responses; some commented that it was difficult to maintain their motivation throughout the whole project and a third stressed the importance of choosing a topic of interest in order to stay motivated. Time management was consistently mentioned by students in reflecting on the project and offering advice for future students. Some students clearly struggled with this, and some felt that they had improved their time management skills through the extended project.

Interestingly, in describing the experience of working on the project, almost 90% of students mentioned working with mentors, including family members, outside of school. For some students, this was shared in the context of discussing the benefits of the Personal Project. For others, accessing mentors as a resource was mentioned as a factor that supported their progress. It emerged that the Personal Project offered a good opportunity for some students to engage with the broader community and develop relationships with family members as they worked together on the project. A question this raised related to the extent to which success on the project is dependent on the level of access to quality resources and mentors outside of school.

In both interviews, students discussed the nature of support they had received from the school, including during dedicated classes. The support and commitment of teachers and the quality of the information and learning experiences provided appeared to influence students' motivation and success with the project. The extent to which students used the learning journal and other resources to shape their ideas and monitor their progress also seemed to depend on how this was supported by teachers and incorporated into the process.

In sharing what they had taken away from the project, a quarter of students specifically mentioned the new knowledge and/or skills they had gained about the topic, as in:

Probably the stuff on super conductivity, I did quite a lot of research on that, before I started my project. I also learned how to write up the things efficiently I guess.

A third of students mentioned that they were very satisfied with their final project, and many spoke with pride about what they had produced:

...it was good to be able to say you'd completed something on your own terms, you did it yourself.

A third of students indicated that they had particularly struggled with the written component of the project report.

Group Comparisons

We compared the responses of students with prior IB experience with those new to IB. As with the previous studies, this comparison was inconclusive. We found a stronger relationship

between students' overall academic achievement (from recent school reports) and the perceived quality of the inquiry process they described through their interview responses. This may be worth investigating with a larger sample.

By examining both students' final grades and the rated quality of their interview responses, we attempted to draw comparisons between approaches that were more promising and those that seemed less effective in helping students work towards a successful outcome. It was difficult to discern a consistent relationship between students' interview responses and their final project grades. It is likely that this association is complex in that it is influenced by multiple factors over time, including students' general (i.e., not specifically project-related) academic skills such as reasoning and literacy. However, we identified responses that appeared to reflect promising approaches to problem solving, and these are reflected in the recommendations that follow.

Summary and Recommendations

Based on our analysis of interview responses, we found that students did demonstrate elements of inquiry, reflection, thinking and openness reflective of the Approaches to Learning Profile. Student responses in the sub-theme of inquiry, showed that many students actively enjoy learning and show a love of learning, seek information from a variety of sources relevant to the task, and are able to identify and work with useful mentors. Student responses in the sub-theme of thinking, showed that some students discussed generating ideas using techniques such as brainstorming and mind-mapping, and could articulate a plan for working towards a solution. Student responses for the sub-theme of reflection, indicated that many identified and reflected on their own strengths and limitations, identified key elements from long-term memory to help them understand problems, and could identify an relevant area of interaction. Student responses for the sub-theme of openness showed that considering the perspectives of others and reasoning in an ethical manner may be areas to explore further.

The following recommendations are made for the consideration of teachers supporting students' work on the Personal Project:

- Few students were able to articulate a clear inquiry question or focus in the initial planning stages, and some seemed confused about why this would be necessary. Additional time spent teaching students to develop effective inquiry questions and to understand the place of questioning and problem definition in inquiry is likely to be useful.
- Since mentors (both school and community based) featured so prominently in students' project work, it may be worth spending time explicitly discussing and planning effective ways to find, contact and work with mentors.
- Although some could identify the relevant Area of Interaction, the results suggest that it would be helpful if teachers talked explicitly about this to students in the early stages of planning the Personal Project, to help students understand the value of identifying an area of focus, rather than seeing this as purely an administrative task.
- Additional focus on how to use a learning journal and other supporting documents to support effective problem solving and inquiry may be beneficial. Some students referred to the journal as an administrative requirement or something they completed retrospectively, rather than as a tool to help them shape and monitor their ideas.
- The results suggest there may be further scope to help students make meaningful connections across instances or discipline areas in shaping their inquiry.
- Some students displayed evidence of strong metacognitive and executive functioning skills; this is an area of competence that other students would benefit from, as many students highlighted the demands of planning, monitoring progress, managing time, weighing alternatives, synthesising information from multiple sources and evaluating

their work as central to success on the project, and in some cases, areas of particular challenge.

- A small number of students displayed openness to the perspectives of others but the low number of responses, and the lack of mention of any of the other elements in this sub-theme, indicate that teachers could spend more time discussing these ideas and their potential relationship to the Personal Project.

Possibilities for future research

This study asked students about their planning on the Personal Project. A larger study could investigate teachers' views about assisting students to plan and complete the Personal Project and also investigate how schools organise relevant supports and resources to assist students to complete the project. The emphasis on mentor assistance and school-based support suggests that it would be worthwhile to seek mentors' and teachers' views about assisting with the Personal Project.

Appendix A. Elements derived from Learner Profile and Approaches to Learning used as codes for transcript analysis

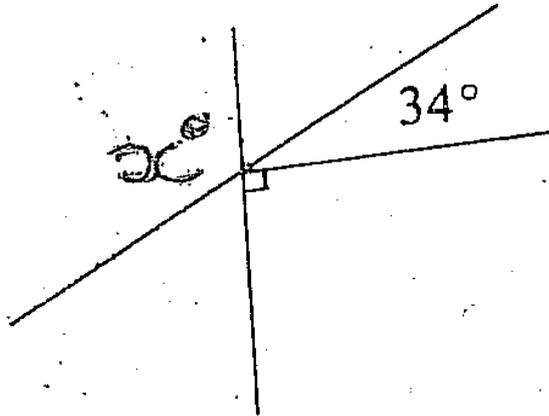
‘Approaches to Learning Profile’ Based on IB Learner Profile Characteristics/ Approaches to Learning		Based on Learner Profile or Approaches to Learning
Inquiry		
I1	Demonstrates natural curiosity	LP
I2	Shows independence in learning	LP
I3	Actively enjoys learning/ shows love of learning	LP
I4	Poses questions for research and inquiry	LP
I5	Defines key terms related to the content of inquiry	Added
I6	Articulates goals for task completion	ATL
I7	Organises task information and resources	ATL
I8	Shows effective time-management for completion of task	ATL
I9	Seeks information from a variety of sources relevant to the task	ATL
I10	Uses a range of technologies to gather information	ATL
I11	Identifies and seeks information from both primary and secondary sources	ATL
I12	Identifies potential bias in sources	ATL
I13	Synthesises information from multiple sources	ATL
I14	Appropriately cites and references sources	ATL
I15	Describes sharing information with others using a variety of media	ATL
I16	Communicates understanding and information in ways that are both novel and effective	ATL
I17	Communicates ideas and information confidently	LP
I18	Demonstrates effective presentation skills in sharing information with others	ATL
I19	Identifies helpful mentors (parents, friends, teachers, neighbours, relatives)	Added
Thinking		
T1	Generates ideas, including through the use of techniques such as brainstorming	ATL
T2	Retrieves relevant knowledge from long-term memory to help understand a problem	ATL
T3	Identifies key elements or information in a presented problem	ATL
T4	Re-reads all or part of a problem to aid understanding	ATL
T5	Draws or elaborates a diagram or visual representation to aid understanding of a problem	ATL
T6	Devises a plan for working towards a solution	ATL
T7	Articulates questions in relation to a problem	ATL
T8	Self-corrects an error in problem solving	ATL
T9	Identifies a specific strategy for problem solving	ATL
T10	Switches to a different strategy	ATL
T11	Breaks down a problem into sub-problems	ATL
T12	Pauses problem solving to self-check for understanding	ATL
T13	Checks the result of a step or move in the problem-solving process	Added
T14	Applies an estimation strategy	ATL
T15	Uses mental imagery	ATL

T16	Applies analogical reasoning to understand a problem	ATL
T17	Employs mathematical calculation	ATL
T18	Makes an error	ATL
T19	Evaluates own progress or solution	ATL
T20	Makes an inference	ATL
T21	Reasons ethically towards a solution	LP
T22	Justifies or explains own beliefs	LP
T23	Makes meaningful connections across instances or discipline areas	ATL
T 24	Explicitly ignores information	Added
T25	Generates a product, either as a step in the solution attempt or as a final answer	Added
T26	Elaborates an idea by adding detail	Added
Reflection		
R1	Sets (articulates) personal goals for learning	LP
R2	Identifies and reflects on own strengths and limitations	LP
R3	Identifies current and developing personal interests in relation to learning	Added
R4	Seeks constructive criticism	ATL
R5	Reflects on own learning process	LP
R6	Employs tools such as learning journals and portfolios to monitor and reflect on own learning	ATL
R7	Identifies relevant Area of Interaction	Added
Openness		
O1	Shows appreciation for own culture	LP
O2	Shows appreciation for own personal history	LP
O3	Displays openness to the perspectives of others	LP
O4	Displays openness to the values and/or traditions of others	LP
O5	Describes more than one point of view in relation to an issue	Added
O6	Evaluates or weighs up a range of points of view	LP
O7	Shows a willingness to grow from the experience of understanding diverse perspectives	LP
O8	Shows empathy, compassion and respect towards the needs and feelings of others	LP
O9	Demonstrates a personal commitment to service	LP
O10	Identifies a need/desire to make a positive difference to the lives of others	LP
O11	Identifies a need/desire to make a positive difference to the environment	LP
O12	Demonstrates a strong sense of fairness and justice	LP
O13	Demonstrates a strong sense of respect for the dignity of the individual, groups and communities	LP
O14	Articulates the importance of intellectual, physical and emotional balance to achieve personal wellbeing for self and others	LP
O15	Describes working effectively in groups, including adapting to roles and taking on responsibility as a group member	ATL
O16	Describes attempting to resolve group conflicts	ATL
O17	Describes negotiating goals with peers and teachers	ATL

Appendix B. Maths Tasks (Study 1)

Task 1.

Find the size of x .

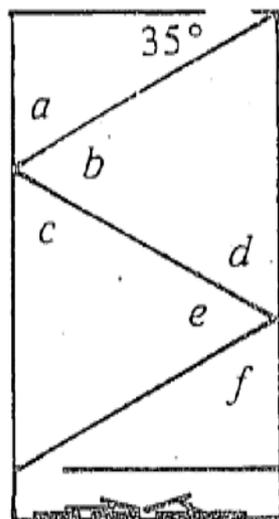


Task 2.

On his bicycle wheel, Tom has six spokes. If the spokes are evenly spaced, what is the measure of the angle between any two adjacent spokes?

Task 3.

A money box is designed so that the coins travel down a sloping path before they reach the collection point. If the angle between the sloping section and the top is 35° , find the measure of the angles marked a, b, c, d, e, f . All tracks have the same slope.



Appendix C. Humanities Tasks (Study 1)

Task 1

It has been suggested that English is on its way to becoming the dominant global language. Is this a good thing? Why or why not?

Task 2

Some commentators suggest that the widespread use of social networking sites such as *Facebook* has changed the way we define the concept of friendship.

In what ways, if any, do you think social networking sites and other recent advances in technology have impacted the nature of friendship and views about what it means to be a friend?

IB Personal Project Interview Part 1 (Initial Planning Stages)

Tell me about the plans you have made so far for your Personal Project. How have you approached your work on the project so far?

How did you decide on this topic for your research?

Which "Area of Interaction" from IB will your project focus on? What made you choose this one?

How have you gone about developing questions for your research? What have you done so far in working on your project?

What will be the next step?

Tell me about the different resources- including other people- that have been helpful to you in developing ideas for your project. .

What has been the most difficult part of your work on the project so far? Tell me about how you've overcome any difficulties you have run into as you've worked on your project.

What has worked well for you so far?

What skills or attitudes do you think have helped you as you've worked on your project? In what way?

IB Personal Project Interview Part 2 (Post-completion)

You might remember that one of my colleagues asked you some questions when you were in the early stages of your Personal Project.

I understand that you have now finished your Personal Project, and I would like to ask you to reflect on the Personal Project and the ways that you used to complete it.

Warm up

What did you do your Personal Project on?

How did you find doing a Personal Project like this?

Choice

1. Why did you choose that topic for your Personal Project? Did you seek to answer a question?

Technique

2. Your Personal Project required you to choose and apply relevant techniques. What does technique mean to you and can you give examples of the technique(s) you applied?

Analysis

2. What do you think was the best part of the Personal Project? Why do you think that was the best part?
3. What was the most difficult part of doing the Personal Project? Why do you think you found these parts of the Personal Project difficult?

Organisation

4. How did you organise the report on the Personal Project? What did you include in your final report?
5. What were the key things you did that helped you complete the Personal Project?

Outcome

6. What do you think is the value for you in doing a Personal Project like this?
7. When you now look back at the experience of doing this Personal Project, is there something that you would do differently if you could do it again?
8. You will do other research Personal Projects in the years to come. What do you think doing this Personal Project has taught about doing these types of assignments, things that you will use again?
9. Did organising and doing this Personal Project teach you anything new about yourself as a student?
10. If you were asked to talk to a group of students who were just about to start the Personal Project next year, what advice would you give them about doing the Personal Project successfully. (What should they do to end up with a good quality report at the end?).