IB Programme: Theory of Knowledge (TOK): Exploring learning outcomes, benefits, and perceptions

Prepared for the International Baccalaureate Organization:
Final Report

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February 2014

University of Western Sydney
Bringing knowledge to life

Preamble

This study examines one of the central elements of the International Baccalaureate Diploma Programme, the Theory of Knowledge (TOK) course. Four case study schools in Sydney, Australia have collaborated with the research team in 2013 in order to share their perceptions, implementation strategies and evaluation of the TOK course. The case study schools have contextually varied situations, locations, histories and philosophies, which collectively provide information on how the TOK has been taken up, interpreted and adapted by particular school communities. All data arising from these case studies has been coded and thematically analysed by the research team. In addition to the case studies, the University of Western Sydney research team have prepared two online surveys, one for teachers and one for students of the International Baccalaureate Diploma Programme (IB DP), which all Australian IB DP schools were invited to complete. Data from these surveys were analysed using bivariate and multivariate statistical analysis. In a further quantitative component of the study, the research team examined mixed cohorts of first year International Baccalaureate (IB) and non-IB university students from a number of Australian universities using the *California Critical Thinking Disposition Inventory* (CCTDI). Together these data sources provide an analysis of the current functioning of the TOK course in Australia and in relation to academic self-concept and critical thinking.

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Introduction

Australian education is considered by some to be a world leader in terms of developing independent, critical thinkers (e.g., Luke, 2000). Yet at the same time, the country's educational system, which allows different curricula to be operated in the nation's six states and two territories, has been unable to implement a sustained and coherent policy on the teaching of critical thinking in upper high school. This study has sought to determine the place of the mandatory Diploma subject, Theory of Knowledge (TOK), in the present educational landscape of Australia. To achieve this, we undertook four case studies at International Baccalaureate schools in New South Wales and administered a range of survey instruments with IB students and teachers Australia wide, and with former IB students studying at university, to explore the effectiveness or other wise of the TOK. The aims and objectives of TOK have been stated by the International Baccalaureate Organization (IB, 2006, p. 5) as:

Aims:

• develop a fascination with the richness of knowledge as a human endeavour, and an understanding of the empowerment that follows from reflecting upon it

• develop an awareness of how knowledge is constructed, critically examined, evaluated and renewed, by communities and individuals

• encourage students to reflect on their experiences as learners, in everyday life and in the Diploma Programme, and to make connections between academic disciplines and between thoughts, feelings and actions

• encourage an interest in the diversity of ways of thinking and ways of living of individuals and communities, and an awareness of personal and ideological assumptions, including participants' own

• encourage consideration of the responsibilities originating from the relationship between knowledge, the community and the individual as citizen of the world.

Objectives:

1. analyse critically knowledge claims, their underlying assumptions and their implications

2. generate questions, explanations, conjectures, hypotheses, alternative ideas and possible solutions in response to knowledge issues concerning areas of knowledge, ways of knowing and students' own experience as learners

3. demonstrate an understanding of different perspectives on knowledge issues

4. draw links and make effective comparisons between different approaches to knowledge issues that derive from areas of knowledge, ways of knowing, theoretical positions and cultural values

5. demonstrate an ability to give a personal, self-aware response to a knowledge issue

6. formulate and communicate ideas clearly with due regard for accuracy and academic honesty.

Given the aims and objectives of the TOK course, this research project has principally looked at the relationship between the reality of TOK as a lived, pre-tertiary subject in Australia, and the practice of critical thinking, which has been defined as:

> Critical thinking is the intellectually disciplined process of actively and skilfully conceptualizing, applying, analysing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.
>
> Critical thinking can be seen as having two components: 1) a set of information and belief generating and processing skills, and 2) the habit, based on intellectual commitment, of using those skills to guide behaviour. It is thus to be contrasted with: 1) the mere acquisition and retention of information alone, because it involves a particular way in which information is sought and treated; 2) the mere possession of skills, because it involves the continual use of them; and 3) the mere use of those skills ('as an exercise') without acceptance of their results. (Scriven and Paul, 2008, online)

In sum, this research project has examined how the TOK course seeks to foster critical thinking skills, such as those outlined above by Scriven and Paul. The purpose of this project has been twofold: (1) to gain a rich understanding of the perceptions of the utility, purpose and content of TOK curriculum by TOK students and teachers and (2) to reveal links between the study/completion of the TOK curriculum and students' self-reported academic outcomes, including: perceived critical thinking skills, academic resilience, motivational self-beliefs, and both actual and anticipated academic outcomes. One of the strong claims made by teachers and academics in a previous study that looked at perceptions of the IB DP in Australia and New Zealand (Coates, Rosicka & MacMahon-Ball, 2007), is that the IB DP offers an excellent grounding in academic skills needed for university life, including the provision of critical thinking skills. This claim will also be explored through this study. In the next section of this paper we provide a background to the study, which is then followed by a description of the research design and the results and conclusions drawn from our study. Later components of the report outline research limitations, literature references, Appendices with research instruments, an example of a case study interview transcript and coded quantitative and qualitative data.

Background

The International Baccalaureate & TOK in Australia

There are currently 155 International Baccalaureate schools in Australia, which include 86 schools that offer the Primary Years Programme (PYP), 47 schools providing the Middle Years Programme (MYP) and 63 schools where students can attend the Diploma Programme (DP). Australia is the fourth largest country in terms of the total number of IB schools behind the USA, Canada and the UK[1]. The International Baccalaureate suite of PYP, MYP and DP is currently offered in state funded schools and private fee paying schools. State funded schools represent 26% of PYP schools, 42% of MYP schools and 13% of DP schools, which are concentrated in the Australian Capital Territory (ACT), Queensland, South Australia and Victoria. There are currently no IB schools in the government education sector in New South Wales (NSW), whereas IB fee paying, private schools exist in all states and territories. The two largest IB school states are South Australia concentrating on the PYP/MYP and Victoria on the PYP/DP. The strong growth of the IB in Australia could be attributed to the attractive nature of having an international, externally verified, high quality curricula model, which offers trusted pathways to tertiary education inside and outside of Australia. However, the significant presence of the IB DP in fee paying schools (87%), can provoke associations with elitism and a perception that the production of global citizens through the IB programmes could enhance divisions between the rich and the poor as those unable to afford an IB education are more likely to become disenfranchised from the international jobs market (see Doherty, 2009; 2012). By comparison, 91% of IB schools in the US and 80% of the IB schools in Canada are state schools (these countries are the two largest providers of IB programs globally).

A brief overview of the TOK

The Theory of Knowledge course of study requires a minimum of 100 hours over the two years of the IB DP (IBO, 2008). TOK assessment consists of a presentation that is internally assessed, with students also required to submit a TOK essay of 1,200-1,500 words from a list of topics supplied each year by the IB. The external assessment of the essay is weighted twice as much as the internal assessment, and students receive a final grade in the range of (A-E) for TOK. This grade is combined with their Extended Essay marks to give students points that contribute to their final Diploma score.

In TOK classes, students study 'knowledge problems' that necessitate asking good questions and constructing coherent answers that relate to the nature of knowledge across the curriculum. TOK is therefore interdisciplinary by nature, and has an open-ended, question based structure, rather than being content heavy in terms of a series of pre-defined study topics. Educators can organise their TOK sessions according to the areas supplied by the IBO (i.e., areas of knowledge—i.e. natural sciences, mathematics, ethics, the arts, history and human sciences; and the ways of knowing—i.e. emotion, perception, language and reason, and the knower(s)). However, the open-ended nature of the TOK syllabus does raise questions about exactly how the subject should be delivered, and how exactly the TOK course relates to any

[1] Information from IBO web site: http://www.ibo.org

improvement in critical thinking skills. These two questions can challenge teachers and administrators, as can further questions which relate to the pragmatics of students whose prime focus is on passing the IB DP with the highest mark possible. These students may focus mainly on doing well in the TOK presentation and essay components of the course, and not dwell or reflect on the broader knowledge questions that the study of TOK necessarily raises. Moreover, IB DP Schools in Australia have to balance the high expectations of students and parents, who want to do well in the IB DP to gain university entrance, with the philosophical modes of questioning that TOK can provoke.

Previous research on the TOK

A surprisingly small number of studies have been conducted of the IB DP TOK subject. Among those relevant to our research, Smith and Morgan (2010) have explored both teachers' and students' 'positions' by using discourse analysis on the IB DP *TOK Curriculum Guide* (IBO, 2006). 'Positions' in this context mean stances or perspectives from which a subject may be understood, in this case TOK. The *TOK Curriculum Guide* summarises the aims and objectives of the TOK and offers basic information needed by teachers in order to deliver the course. Smith and Morgan contend that their analysis revealed two constructions of TOK:

1. "TOK-as-hero" in line with the transformational curriculum orientation that aims to create a better and more peaceful world through educating self-aware and compassionate students; and
2. "TOK-as-developmental-facilitator" in line with the transactional curriculum orientation that teachers will facilitate the development of students' critical thinking skills.

Smith and Morgan also found that TOK aims to offer opportunities for students to consider and reflect on knowledge that may be absent in other disciplines. Through the TOK as the agent of transcendence, consideration and reflection, students are expected to transform and grow their characters as international citizens. From the transactional curriculum perspectives, the *Guide* points out the special position teachers have in TOK in that they are not expected to be experts, because the main emphasis of TOK is on the development of critical thinking skills rather than covering particular content. The role of a teacher is described as a facilitator that explores questions in joint effort with students to develop their skills.

Drawing on firsthand experience of teaching TOK and also research into its philosophical underpinnings, Cole (2005) asserts that teacher-student relationships move beyond a mode where students passively "expect to be given more knowledge to learn and reproduce under examination conditions" (p.212). Students assume more active roles in the classroom, as TOK requires them to continuously change and reconstruct their ways of understanding and seeking knowledge. Using these new thinking skills, students and teachers better engage with, question and reproduce knowledge required in the six academic subjects of the DP. Gazda-Grace (2002, p. 86), another teacher for the IB Diploma, summarized from her own teaching experience that a major task for TOK teachers is to create a psychologically safe learning environment to encourage students to "explore options, question assumptions, understand global values, look at issues from different perspectives, and refine their critical and creative thinking skills".

Meanwhile, Zemplen (2007) has raised concerns regarding the implementation of TOK in fostering critical thinking, and in particular the relationship between critical thinking and science education. In brief, Zemplen argued that natural science should be treated as a "superior form of knowledge" (p. 180). According to Zemplen, in the TOK course description critical thinking skills are not subordinated to science-education and, with this in mind, somewhat controversially suggests that the teaching of critical thinking as separate from the scientific agenda may compromise the primacy of science as a mode of analysis. According to Zemplen there is, therefore, a necessity to look into the teachers' perception of their roles in the teaching of TOK, and particularly with respect to their teaching methods and the perceived challenges of science.

Taking a very different focus, Gan's study (2009) looked at the TOK from the perspective of 11 Chinese IB students enrolled in the Diploma Programme in Australia. Many regarded TOK as a special challenge for them. The challenge was mainly due to their lack of similar philosophical studies in the Chinese curriculum as well as experience in deep reflection and thinking. Students took the view that the TOK is "all the Western side of culture" (p. 293) and felt that, with some exceptions, non-Western ideas were not treated in as much depth as the Western concepts. Nonetheless, Gan (2008) found that Diploma subject's such as the TOK encouraged students to move away from a 'preference for quiet passivity' and take on a more assertive and expressive presence in classrooms, which was exemplified by student comments that as a result of the TOK "you [students] can do that kind of philosophy bragging" (p. 299). Indeed, the majority of the students interviewed viewed their experience of learning in the IB DP as being positive and valuable, because they perceived the skills learnt were "very useful in the future" (p. 296).

Our study aims to add to the available literature on the TOK course. This contribution examines the critical thinking skills that are delivered through TOK, the effects on first year university critical thinking, the relationships between TOK and other IB DP subjects, general perceptions of TOK, and measurable post-secondary factors of success that could be attributed to TOK. In the next section, we detail the research design that has drawn on quantitative and qualitative methods to analyse the relationships between TOK, self-concept and critical thinking.

Research Design

Research Questions

In order to more fully understand the experience of TOK teachers and students, as well as evaluate links between students' partial or full completion of the TOK curriculum and their motivational and dispositional outcomes, we have explored the following five research questions:

RQ#1: To what extent do students develop critical thinking skills/higher order thinking skills as outcomes of their participation in the TOK course?

RQ#2: What is the relationship between participation and/or performance in TOK and external measures of critical thinking at the postsecondary level?

RQ#3: To what extent do the learning outcomes of the TOK course impact student learning in other IB DP subjects and core courses (i.e., extended essay) as perceived by teachers and students?

RQ#4: What are students' and teachers' perceptions toward the TOK course (i.e., learning engagement, effort, perceived benefits, challenges, and factors of success)?

RQ#5: What is the relationship between performance in TOK and postsecondary success?

To thoroughly address all five research questions, this project has consisted of two major phases of data collection. In Phase One of the project – working with IB secondary schools (during early/mid 2013) – students, teaching staff and administrative staff from four IB high schools in the greater Sydney metropolitan area completed the *IB Secondary School TOK Course Assessment (Teacher Version/Student Version).*[2] The four schools, which were later to become the four case study schools described below, trialled the high school quantitative instruments to examine any preliminary problems and to look for ways to improve the survey design. This instrument, which consisted of closed-ended survey items, was subject to bivariate and multivariate analysis to ascertain how:

(1) perceptions of the dispositional effectiveness of the teaching and learning of TOK are related to use of critical thinking skills and academic resilience for students of TOK as well as how,

(2) both teachers' self-beliefs regarding the teaching of TOK skills and attitudes toward the TOK curriculum are related to its perceived effectiveness.

In June/July 2013 IB DP students and TOK teachers at all Australian IB DP schools were invited to complete the *IB Secondary School TOK Course Assessment*.

Over the course of five months (beginning February 2013), each of the four schools that were used to pilot the *IB Secondary School TOK Course Assessment* were also used as sites for observation work, interviews, document analysis and focus groups. The aim of this case study work (Yin, 2009) was to gain a

[2] These two measurement instruments were developed by the research team, in consultation with the IB, during late 2012. They include both previously-tested and validated indices where appropriate, as well as context-specific demographic and open-ended items (see Appendices A-D for the full measures and associated scales).

richer perspective of the nuanced ways in which TOK is taught and considered in a variety of school contexts (1 boys' school, 1 girls' school, 2 co-ed schools — 1 suburban school and 3 central Sydney schools). In this component of the study, qualitative thematic analysis (Saldaña, 2009; Boyatzis, 1998) was used to understand precise ways in which TOK is conceptualised, positioned and operationalised in the four schools. All transcript data collected from the case studies was open-coded using NVivo software. Robust and evidence-based themes (Walsh, 2003; Gibbs, 2002) that illustrate and explain the teaching and learning of TOK at the schools were developed through collaborative discussion about the codes. The research team carried out 22 teacher interviews, 8 student focus groups and 5 administrator interviews during the course of the case studies across the 4 schools.

In Phase Two of the project (beginning mid-April 2013), the research team distributed the *California Critical Thinking Disposition Inventory (CCDTI)*[3] to a cohort of first year university students, including a subsample of 2012 IB alumni. The CCTDI assessment (see Insight, 2000) measures six key areas of critical thinking disposition: Truth-seeking; Open-mindedness; Analyticity or Foresightfulness; Systematicity; Critical Thinking Self-Confidence; Inquisitiveness and Judiciousness or Maturity of Judgment. As published by the survey distributors, each of these six categories were developed in line with "The Delphi Report" (Facione, 1990), a synthesis of expert consensus on the 'ideal critical thinker' by academics across the USA in the 1980s. The CCTDI has been used successfully in more than 40 countries worldwide. This phase of data collection also included both a demographic portion, with an item ascertaining whether or not participants had completed the Diploma program and the TOK unit, as well as three additional indices measuring students' (1) perceptions of their academic self-concept, (2) perceptions of their self-efficacy with regards to critical thinking skills and (3) anticipated university outcomes.[4] As such, the cohort was able to be compared by their higher school curriculum (non-DP versus DP curriculum), on their overall critical thinking dispositions and associated sub-scales, as well as on their academic self-beliefs, and examined for statistically significant differences between the two groups. Further, correlational and multiple regression analyses (Tacq, 1997) allowed for an exploration of the relationships between students' critical thinking dispositions and their academic self-beliefs.

Results from the 2 phases of the study have converged in a multiphase design framework (Creswell & Plano-Clark, 2011), with each of the quantitative and quantitative strands of the research accorded equal weighting. The presentation and organisation of the findings in subsequent sections of this report reflect this approach.

Sample

The total study sample consisted of four case study schools located in Sydney, Australia; 63 schools from across Australia that took part in *IB Secondary School TOK Course Assessment* (students and teachers); and several cohorts of university undergraduates who completed the CCTDI online evaluation of critical thinking dispositions and academic self-beliefs. In this section we provide further details about the case study sites and various participant groups that took part in the study. Readers should note that the

[3] This measurement instrument is a widely-used, psychometrically validated inventory developed by a team of designers and statisticians at Insight Assessment (California, USA). Sample items from the inventory are included with Appendix C as part of the *University Life* survey.

[4] See Appendix C for the full *University Life* survey, including sample items and scale descriptions from the CCTDI.

different levels of detail for each of the case study schools (e.g. TOK marks achieved in different years) reflect the varying amounts of publically available information provided by the schools.

Qualitative sample

School 1

School 1 is a thriving, Christian-based private co-educational school on the outskirts of greater Sydney. The school sits in its own grounds that border native Australian forest and agricultural lands. The grounds of the school contain all years of schooling from K-12 in their own purpose-built facilities. In year 12, 47% of students undertook the IB DP and 53% took the HSC (High School Certificate in NSW). In 2011, there were 54 candidates for TOK, of which 57% achieved an A or B according to the set TOK criteria. In 2011, the average IB score of 54 candidates was 31. The school's annual report states that the vast majority of graduates from School 1 go on to higher education, though there was no specific information about where they went or what they studied. School 1 has 49% of their students in the highest quartile of socio-educational advantage according to the *MySchool*[5] web site and 16% are LBOTE (Language Background Other than English).

School 1 describes itself as a leader in integrating the MYP curriculum with BOS (Board of Studies) curriculum requirements since 2003. The school runs all three of the IB programmes, making the transition from primary to secondary education within the parameters of the IB curriculum, as well as catering from students who follow the local NSW syllabus guidelines.

School 2

School 2 is a bustling, split site school in an inner city Sydney neighbourhood that was established in the late 19th century. This co-educational school is positioned in an upmarket urban district close to the harbour. In 2011, 46 Diplomas were awarded out of 139 students who took the IB Diploma and the NSW HSC. The annual report converts all results to the ATAR score for Australian university entrance and reports that: 7 students achieved an ATAR of 99 or more, 17 students achieved an ATAR of 98 or more, 30 students achieved an ATAR of 95 or more and 49 students achieved an ATAR of 90 or more. In 2010, 19 students received a C in TOK, 9 achieved a B and 4 achieved an A out of 40 entrants. In 2011, 2 achieved an A, 23 a B and 17 a C in TOK out of 46, and in 2012, 17 received a B and 23 a C grade out of 49 candidates. School 2 currently has 100 students studying TOK (43 in Year 12 and 57 in Year 11). School 2 has 10% LBOTE and 98% of students are in the highest quartile of socio-educational advantage.

The school's annual report indicates that post-school destinations included: Sydney University (38), University of New South Wales (22), UTS (17), Macquarie University (14), Australian National University (10), other Australian universities (19), VET (2), Overseas (12). Faculty area choices include: Commerce/Business/Economics (38), Arts (18), Engineering (16), Medical (15), Media & Communication (10), Creative/fine arts (9), Law (8), Science (8), other, including combined Degrees (18).

[5] The *MySchool* web site is an Australian government funded web site that includes measures of literacy and numeracy skills at years 3, 5, 7 & 9 taken from examinations across Australia and publishes the data in the form of tables that compares the results of each school with like schools. The site includes further school specific data which has been used by the team in this report.

School 3

School 3 is a prestigious, Christian-based Anglican private school in the inner western suburbs of Sydney. This all-boys school sits in its own grounds that border well established residential homes from the early twentieth century. The grounds of the school contain all phases of schooling from K-12 in their own purpose-built facilities. In year 12, 43 students undertook the IB DP course and 166 completed the HSC (High School Certificate in NSW). In 2012, there were 43 candidates for TOK, of which 62% achieved an A or B according to the set TOK criteria. The average IB score in 2012 of 43 candidates was 35.2 with 26% of the candidature achieving the full 3 extra points from the combined TOK and Extended essay. Over 88% of the candidature obtained results above the IB world average of 30.01. 85% of HSC candidates went to university whereas 100% of the IB Diploma candidates went to university.

In 2012 there were 209 Year 12 students, of whom 46% have a language background other than English and 68% are from families in the highest quartile of socio-educational advantage in Australia (*MySchool* website). The post-secondary destinations of the 2012 candidates are: Sydney University (43%), University of NSW (26%), University of Technology Sydney (19%), University of Western Sydney (5%) and Macquarie, Charles Sturt and Canberra all receiving a single student (totalling 6%).

School 4

School 4 is a girls' secondary day school in a highly urbanised area close to the Sydney city centre. It is the only one of the four case study schools that does not have a junior/ primary campus or component. The school was established in the late 19th century by a Catholic order and has focused exclusively on the education of girls since that time. The early history of the school was marked by an emphasis on excellence in arts and culture, as well as academic achievement, and this carries through to the present as the current major building project is an Arts and Cultural Commons building that will provide high quality dedicated visual and performing arts facilities. The school currently has 4% of students with LBOTE, while 70% of students are from families in the highest quartile of socio-educational advantage in Australia, according to the *MySchool* website. In 2007, the school became the first Catholic girls' school in the state to offer both the IB MYP and the IB DP. Since 2010, all students from years 7-10 complete the IB MYP, which overlays the state curriculum, choosing during year 10 whether they will pursue IB DP or HSC studies in their final two years of secondary school. In 2012, 24 students completed the IB DP while 155 completed HSC. In that year, IB students achieved an average score of 37.54 out of maximum of 45, significantly exceeding both international and Australian averages. One student received a perfect score of 45, while 25% of the IB cohort achieved UAC ranks of 99 or higher.

The most recent Annual School Report (2011), available on the school website, states that 4 of the cohort of 26 in 2011 received an A in Theory of Knowledge while another 11 students received a B. Post school destinations are not reported in the School Annual Report, however it is noted that 25 of 26 IB students in 2011 received first round offers to the university and degree of their first choice. In 2013, there are 49 students in three TOK classes in year 12, and 25 students in two year 11 TOK classes. At each year level, classes are timetabled concurrently to enable collaboration, team-teaching and reconfiguration of classes for various activities. Four teachers with varying experience in the subject teach TOK at School 4, including the Director of the Senior School.

Quantitative sample

The secondary school sample of year 11 and 12 students of TOK and their TOK teachers were drawn from the 63 secondary schools across Australia offering the IB Diploma Programme. Of these, four schools were the sites of case study research, as noted above, offering personal access and face-to-face recruitment of participants. The remaining 59 schools were initially approached via emails encouraging study participation sent by the IB to the principal and DP coordinator. Follow-up emails were sent directly by the research team. Recruitment emails contained information about the research and also URL links to both the teacher and student versions of the online survey.

The final national sample of TOK teachers consisted of 83 participants (59% male), with the large majority of these (n = 64; 77%) selecting TOK as their core teaching subject. Given the number of estimated TOK teachers across Australia (approximately 182, based on estimates of student numbers and class sizes of 20), this figure represented 46% of the total population[6]. As far as other key learning areas represented in the DP, teachers primarily taught in Group 3 subjects, including History, Psychology and Economics (n = 26; 31%) and Group 4 subjects, including Biology and Chemistry (n = 19; 23%). While 17% of the sample reported that they were in their first year of teaching the TOK curriculum, by and large participants were an experienced group, with nearly 70% (n = 57) reporting more than 10 years teaching experience overall. The majority of the group taught at co-educational schools (n = 62; 75%) with 45 total schools (71% of the total number of Australian IB schools) represented across all eight states and territories of Australia.

The final national sample of TOK students consisted of 1,338 young people (59% female), from year 11 (n = 662) and year 12 (n = 676). This participation rate represented approximately 37% of the total number of students in years 11 and 12, based on numbers provided by the IB[7]. In line with the sample of TOK teachers, nearly 70% of the sample (n = 930) attended co-educational schools across the country, with the remaining 30% attending single-sex schools. The sample represented a total of 48 schools across Australia (76% of the total number of Australian IB schools), from every state/territory except the Northern Territory. The largest numbers of both student and teacher participants were drawn from schools in Queensland and New South Wales. Table 1 shows the dispersion of participating TOK students and TOK teachers by state/territory.

[6] It is worth noting that this estimate is based on each teacher taking a single TOK class of 20 students, which is likely an underestimate as teachers may take more than one class.

[7] The IB database indicates that 1,827 Australian year 12 completions of the TOK essay in 2012. We have doubled this number (n = 3654) for a rough estimate of total year 11 and 12 TOK participants from across Australia. To estimate total numbers of TOK teachers, we have divided this figure by 20 (estimating class sizes of 20).

Table 1: TOK Teacher and Student Distribution by State/Territory of Australia

	TOK Teachers			TOK Students		
	Frequency	%	# of Schools Represented	Frequency	%	# of Schools Represented
Queensland	23	27.7	9	423	31.6	8
New South Wales	20	24.1	14	363	27.1	14
Victoria	16	19.3	8	263	19.7	8
South Australia	13	15.7	6	208	15.5	7
Aust Capital Territory	4	4.8	3	34	2.5	6
Western Australia	3	3.6	3	36	2.7	4
Northern Territory	2	2.4	1	0	0.0	0
Tasmania	2	2.4	1	11	.8	1
TOTAL	N = 83	100.0	N = 45	N = 1,338	100.0	N = 48

In an effort to understand whether or not completion of the TOK curriculum made an impact on postsecondary outcomes, both former IB DP students and non-IB students in their first semester of university study were sampled to examine between-group differences. Participants who took part in our survey of university students were recruited using two methods. First, recruitment emails with study information and URL links to a survey and were sent to a list of 99 former Diploma Programme students from the graduating class of 2012 who were part of the IB's alumni program. Second, lecturers from the School of Engineering at the University of Sydney and the School of Education at Queensland University of Technology were contacted directly to assist with dissemination of the recruitment materials to university students undertaking their first semester of tertiary studies[8]. IB and Non-IB students at these two institutions were informed about the study via two separate announcements on their course's content management system (Blackboard), where each announcement generated an email sent to students' university accounts.

The final university undergraduate sample consisted of 389 participants (65% female) with 99 of these (25% of the total sample), having completed the TOK curriculum. The majority of these participants were from the University of Sydney (n = 291; 75% of the total sample) with the Queensland University of Technology representing the second largest participant group (n = 24; 6% of the total sample). Of the sample that had completed the TOK curriculum, the top three universities represented were: the University of Sydney (16 participants; 16% of the subsample), the University of Queensland (10 participants; 10% of the subsample) and the University of New South Wales (9 participants; 9% of the subsample). Given the spread of universities represented in the TOK sample, it appears that the majority of these young people were recruited through emails sent to the IB alumni group, rather than through direct university recruitment.

Analytic Methods

In order to accomplish the goals of the project, a mixed-method design was used to allow for an examination of broad, numeric trends using various measures of the key variables under study, as well as a contextualised description of the purpose and place of the TOK curriculum as evidenced through case study data.

[8] Other universities/faculties from NSW universities were approached (including the Faculty of Arts and Social Sciences from USYD; the School of Arts and Media from UNSW; and the School of Business at UTS); however, despite our best attempts, these recruitment efforts ultimately proved unsuccessful.

Qualitative Methods

According to Merriam (1988, p. 16), "Qualitative case study can be defined as an intensive, holistic description and analysis of a single entity, phenomenon or social unit. Case studies are particularistic, descriptive and heuristic, and rely heavily on inductive reasoning in handling multiple data sources." The single entities of this study are four IB schools in the greater Sydney area (3 central and 1 in a suburban location), and the primary data sources for this study are interviews with teachers, students and other informants such as school administrators and parents. Other data sources have included observations and document review, such as of school web sites and school brochures. The case studies have been written up as examples of how IB DP schools implement the TOK, and include the multiple perspectives of those who make up each school and are involved with the delivery, reception and running of the TOK courses. The qualitative case studies in this research project may be summarised through the triangulation of the data thus:

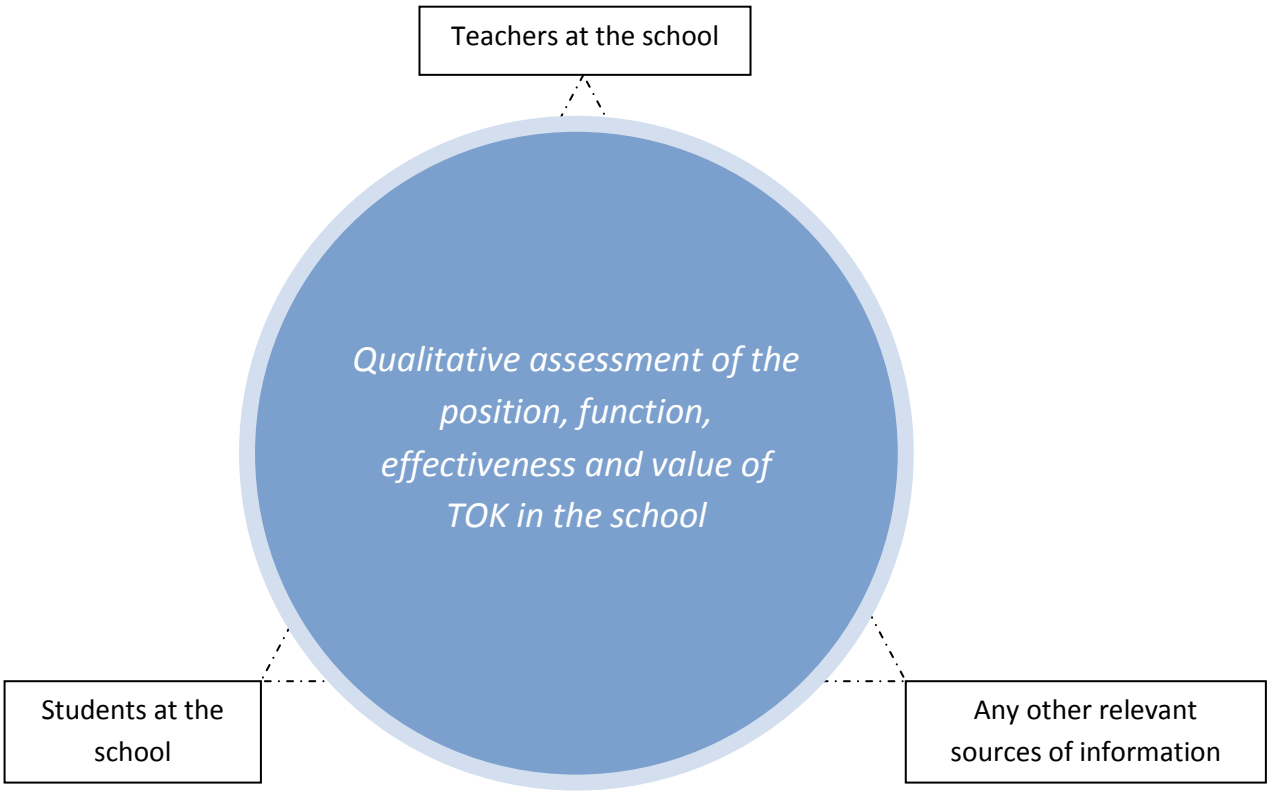

Figure 1. The triangulation of qualitative data in the 4 case studies

The qualitative methodology of the project used a multi-site and multi-source approach. This approach treats each school separately, while also examining codes and themes across the schools. The precise data collection methods used for the case studies included: 1) teacher interviews (n=22); 2) focus groups with TOK students (n=8); 3) interviews with administration (n=5) or other school personnel; 4) document analysis of relevant literature produced by the schools, and; 5) observations of TOK lessons (n=10). Interviews of teachers lasted for approximately 40 minutes each and focus groups were approximately 30 minutes each and consisted of 4 to 7 students. The aim of the qualitative data collection was to provide answers to RQ#1, RQ#3 & RQ#4. The multi-site data from the qualitative case studies is non-generalizable, but provides informative insights into the opinions, judgements and views about TOK by those who are primarily tasked with the ways in which the subject is implemented. We transcribed audio

recordings from the fieldwork, which were coded and analysed by the researchers for themes and then deployed an interpretative matrix on the data based on RQ#1, RQ#3 & RQ#4 (see Appendices J, K & L).

The qualitative case studies provide rich contextually specific representations of the TOK at each of the school sites. While each detailed case study is particular to a single school, as noted above, the coding, thematic analysis and common case study format of the RQ#s across the four schools has enabled some cross-school similarities and differences to be identified. Notably, although each school delivers TOK independently, there is a strong cross-school TOK network amongst IB schools in NSW & ACT comprising regular meetings, common professional development and extensive sharing of resources and approaches within that network. To some extent examining these four schools provides an insight into a professional learning community that exceeds the individual schools. Interviews with teachers were designed as a series of questions that draw respondents through increasingly deeper and more explicit articulations of their understandings of the modes of critical thinking that are developed through TOK, as well as their particular approach to TOK within their school and its impact on students in the present and the future. Focus groups with students have identified student views of the TOK including the value students place on TOK. Quotes from teachers, students and other study participants are used to illustrate what each of these groups perceive the advantages and disadvantages of the TOK to be. Meanwhile, observations of classrooms contextualise the reflections on teaching and learning in the TOK offered by teachers and students.

Quantitative Methods

The quantitative portion of the project consisted of two phases of online data collection targeting: (1) students and teachers of the TOK curriculum at secondary schools offering the IB Diploma Programme and; (2) a group of first year university students allowing for comparison of former-IB DP and non-IB DP graduates. The survey instrumentation employed during these two phases consisted of a combination of original and previously-validated measurements. Reliability coefficients (e.g. Cronbach's Alpha scores) as reported by the scale authors are presented below for the pre-existing measures; outcomes for the original measures are presented alongside results from Exploratory Factor Analyses (EFA) described in the relevant findings sections for each original measure.

In the first phase of online data collection, current students of the TOK curriculum completed a questionnaire asking about their perceptions of the direct impact of TOK on:

i. critical thinking skills, including their ability to think logically and unpack complex problems, and
ii. "life world" skills (e.g. whether or not TOK helped them "solve everyday problems" or excel in the "real world")

Each of these were asked through a series of original items developed for the current project. Further, the 14-item *Critical Thinking Strategies Scale (CTSS)* developed for the purposes of this study, measured TOK students' perceived likelihood of employing a variety of critical thinking skills when confronted with new knowledge. For both of these original measures, the set of critical thinking skills under examination was drawn from "The Delphi Report" (Facione, 1990), a synthesis of expert consensus on measurable critical thinking skills. The 5-item *Critical Thinking* subscale of the "Motivated Strategies for Learning Questionnaire" (MSLQ; Pintrich, Smith, Garcia & McKeachie, 1993), found to have high internal consistency (Cronbach's Alpha = .80), provided a secondary measure of critical thinking skill use. Meanwhile, students' academic resilience was measured through the 6-item *Academic Resilience Scale* (Martin & Marsh, 2006), also found to have high internal consistency (Cronbach's Alpha = .89). The development of the original

items used in the student questionnaire was influenced by the project C.I.'s (A/P David Cole) years of experience as a head teacher of TOK and subsequent knowledge of the aims and content of the TOK curriculum.

Current teachers of the TOK curriculum were asked about their self-efficacy beliefs around teaching TOK content and skills to their students in the *Theory of Knowledge Teacher Self-Efficacy Beliefs Scale (TOK-TSE),* also developed for the purposes of the current study. Domain-specific content relevant to specific areas of pedagogy, content and practice for the items in this scale was informed by the project C.I.'s years of experience as a head teacher of TOK, as well as through official IB resources relevant to TOK. Studies of teacher self-efficacy show this construct to be strongly linked to effective teaching practices as well as positive classroom experiences (Hoy & Woolfolk, 1993; Tschannen-Moran, Woolfolk Hoy & Hoy, 1998). Accordingly, we were particularly interested in TOK domain-specific teacher self-efficacy beliefs (e.g. self-beliefs specific to the teaching of the TOK curriculum) with the understanding that teachers' higher reported beliefs are likely to 1) be linked to their positive perceptions of the TOK curriculum itself (and its associated pedagogies) as well as 2) have a positive influence on their students' achievement in TOK. Further, teachers have been given the 14-item *Critical Thinking Strategies Scale (CTSS)*, also used with the student body sample, as above, to ascertain their beliefs about the likelihood of their TOK students' use of the various critical thinking strategies identified. Teachers have been asked about their perceptions of the purpose of the TOK curriculum, challenges presented by the TOK curriculum, and most enjoyable aspects of the TOK curriculum, both personally and as perceived for their students. Lastly, teachers have been asked to report on which elements of TOK curriculum content and associated skills they use within their own TOK classes.

In the second phase of online data collection, first year University students were asked to complete a questionnaire that included the *California Critical Thinking Disposition Inventory* (CCTDI; Facione, Facione & Giancarlo, 2001), a 75-item measure of their dispositional tendencies regarding the employment of a range of critical thinking skills in their everyday lives. This measure boasts very high internal consistency (Cronbach's Alpha = .90) with subscale reliabilities for the seven subscales ranging from 0.72 – 0.80. This measure has been used in a wide variety of research (Wangensteen, Johannson, Bjorkstrom & Nordstrom, 2010; Tiwari, Lai, So & Yuen, 2006) as a suitable proxy measure for individuals' actual critical thinking skills (Facione & Facione, 1997). Given our focus on students' self-perceptions related to their task ability, we view this dispositional measure as preferable to a measure of actual critical thinking skills. Further, based on the known positive correlation between the CCTDI and the equivalent measure of critical thinking skills,[9] (Yang & Chou, 2007; McCarthy, Schuster, Zehr & McDougal, 1999; Facione, Facione & Sanchez, 1994) we propose that students' critical thinking dispositions are likely causally related to their demonstrable thinking skills. This understanding of the relationship between dispositional self-assessments and related outcome skill measures is in line with previous research on the reciprocal effects of academic self-beliefs (specifically *self-concept*, see below) and academic achievement, which show each to be a significant causal predictor of the other (Marsh & Craven, 2006).

In addition, university student participants were administered the 7-item *Self-Efficacy for Critical Thinking Scale (SECT)*, developed for the purposes of the current study and constructed using relevant critical thinking skills as identified within "The Delphi Report" (Facione, 1990). Since self-efficacious

[9] We are referring here to the California Critical Thinking Skills Test (CCTST), also developed by Facione (1990) and made commercially available by Insight Assessment.

learners have been shown to think and act in self-enhancing ways, persist in the face of difficulties, and exert considerable effort to achieve their goals (Bandura, 2012; Pintrich & Schunk, 2002) it is no surprise that across all levels of formal education, self-efficacy has been found to predict learner motivation and achievement outcomes across many subject areas (Pajares, 1996; Schunk & Meece, 2006; Zimmerman & Kitsantas, 2005). As such, it is considered to be a crucial outcome measure for the university cohort.

First year university students' academic self-concept was measured using the 10-item *Academic Self-Concept (General) Scale* from the "Self-Description Questionnaire III" (SDQIII; Marsh, 1992), which has been found to have excellent internal consistency (Cronbach's Alpha = .92). Academic self-concept is often regarded as a proxy measure of students' actual academic outcomes (Byrne & Worth-Gavin, 1996) and positive self-concepts are considered to be advantageous within academic settings. Due to the difficulty in comparing marks across universities, a measure of academic self-concept is regarded as preferable, given its affordance to measure participant academic attributes from a variety of institutions at a comparable level. Lastly, a 6-item measure of anticipated university outcomes, developed for the current study, has been used to assess students' self-beliefs regarding course completion and associated marks. Items here included students' anticipated course completion, anticipated marks and anticipated unit failures.

A comparison of former IB DP students' reported academic self-concept, anticipated university outcomes, and Australian Tertiary Admissions Rank (ATAR) scores to their reported TOK essay marks from their final year of the DP programme allowed for further indication of the influence of TOK course performance on tertiary opportunity and success. Academic self-concept and ATAR scores were particularly useful for gaining additional insight into the overall differences in university rankings for former IB DP and mainstream (e.g. non-IB DP) students. As an additional point of data, the researchers were able to access university intake data from their home university (University of Western Sydney) to look for subgroup differences in ATAR scores between mainstream (e.g. non-IB) students and the small group of former IB students entering UWS between 2011-2013.

In order to investigate the project research questions as detailed, the following statistical analyses were employed:

- Analysis of descriptive statistics: to report on differences in mean scores for various sub-cohorts of participants (e.g. by gender, year of schooling/teaching, completion of the TOK curriculum, etc.)
- Exploratory Factor Analysis (EFA) for newly developed scales: allowing for an examination of the construct validity of key variables prior to conducting between and within-group analyses
- Multiple regression analysis: to test for which variables or participant demographic characteristics are the best predictors of key variables of interest (e.g. TOK students' use of critical thinking skills, TOK teachers' self-efficacy beliefs, university students' critical thinking skills dispositions and ATAR scores).

Composition of research methods for each RQ#

In the following section we provide a summary description of how quantitative and qualitative methods have been used to address each of the study's five research questions:

RQ#1: To what extent do students develop critical thinking skills/higher order thinking skills as outcomes of their participation in the TOK course?

This research question has been explored through quantitative data from both students and teachers of TOK. Current TOK students' have been asked to self-report on the likelihood of their use of critical thinking skills when confronted with new knowledge (*CTSS*). Further, these students have been asked to indicate the influence of their TOK study on their use of related critical thinking skills. Teachers of TOK have also been asked to report on their TOK students' overall likelihood to employ critical thinking strategies in their learning as well as their own self-efficacy beliefs with regards to teaching to the reported aims and skills required by the TOK curriculum (*TOK-TSE*).

This question has been addressed qualitatively in terms of the opinions and perceptions of the students, teachers and administrators at the participating case study schools and their understandings with respect to how critical thinking/higher order thinking skills are enhanced or otherwise through the subject of TOK as it is run at their schools. In addition, the team used observational data to answer this question and looked at relevant TOK documentation in the schools.

RQ#2: What is the relationship between participation and/or performance in TOK and external measures of critical thinking at postsecondary level?

At the postsecondary level, two cohorts of university students, former TOK students and students who did not undertake the IB DP were compared using two quantitative measures: (1) an external measure of critical thinking skills disposition (*CCTDI*) and (2) a measure of critical thinking self-efficacy beliefs (*SECT*).

RQ#3: To what extent do the learning outcomes of the TOK course impact student learning in other IB DP subjects and core courses (i.e., extended essay) as perceived by teachers and students?

A number of items in the TOK Teacher survey (*TOK-TSE*), both closed and open-ended, addressed themes covered in this research question. Specifically, teachers of TOK were asked to report on their perceived links between the TOK course and other areas of study (both in the Diploma Programme and in tertiary study and work/life). They were also asked to comment on whether or not their school valued the TOK course and their colleagues' perceptions of the TOK course in general. Further, the TOK Student survey sought to uncover links between participation in the TOK course and the development of academic resilience using the *Academic Resilience Scale* (*ARS*).

Qualitative data from the teacher interviews, student focus groups, observation, document analysis and administrator interviews were triangulated, coded and analysed for thematic themes that address RQ#3 to understand the extent to which TOK impacts on other DP subjects and core courses such as the extended essay.

RQ#4: What are students' and teachers' perceptions toward the TOK course (i.e., learning engagement, effort, perceived benefits, challenges, and factors of success)?

The online survey instrument for current TOK teachers has examined self-efficacy beliefs specific to the skills associated with teaching of TOK. Further, TOK teachers have responded to an open-ended question eliciting their perceptions on the impact of TOK on students' later lives.

The case study methods used to address this question included 1) teacher interviews; 2) student focus groups; 3) observations; 4) document analysis. For example, teachers were asked questions regarding the ways in which they taught TOK and CT, and to describe student engagement with TOK. Meanwhile, topics

raised with students included discussing the aims and objectives of TOK, their experiences of TOK lessons and their opinions with respect to the development of CT skills.

RQ#5: What is the relationship between performance in TOK and postsecondary success (i.e., GPA or other measures of student performance; continuation; graduation)?

The online survey instrument for university students collected data on their self-reported mark of their TOK essay (for former IB DP students only) as well as three other three other self-report measures of student postsecondary success: academic self-concept (*ASC scale*), Australian Tertiary Admissions Rank (ATAR) score, and anticipated university outcomes in order to gauge the strength of the above relationship. A comparison group of non-IB DP students was also examined on the above measures to test for between-group differences on students' academic self-concept and ATAR scores. Lastly, as the researchers were able to access university intake data from their home university (University of Western Sydney), this data was examined for subgroup differences in ATAR scores between mainstream students and the small group of former IB students entering UWS between 2011 and 2013.

Results

In this section, the quantitative and qualitative results of the study have been reported. We then provide an integrated summary of the results in a subsequent section that outlines our Conclusions and Recommendations.

RQ#1: To what extent do students develop critical thinking skills/higher order thinking skills as outcomes of their participation in the TOK course?

Quantitative Findings:

Current TOK students from across Australia were asked to report on the impact of the TOK course on two separate areas of related TOK course outcomes: *"lifeworld" skills* and *critical thinking skills* (see Appendix A, Section Two). Items addressing "lifeworld" skills asked students whether or not they believed that the content of TOK prepared them for everyday life in the "real world" or, in other words, had real-world applicability (sample item: "The content of TOK has helped me solve everyday problems"). Items relating to critical thinking skills specifically addressed key skills/actions associated with critical thinking (sample item: "Taking TOK has taught me how to think critically before passively accepting new information"). Each of these items were measured using a 7-point Likert scale, ranging from "Strongly Agree" (7) to "Strongly Disagree" (1), with an anchor point of neutrality ("Neither agree nor disagree" [4]).

Exploratory Factor Analysis (EFA) was used to help determine the final composition of each of the two scales (Appendix F). Results showed that both scales contained items with low loadings (one from the "Lifeworld" set and one from the "Critical Thinking" set); these items were subsequently removed from the analysis. Mean scores and reliability scores for the resultant scales are presented in Table 2. Each of the two subscales was found to have "good" (0.84) or "excellent" (0.93) internal consistency, as measured by the Cronbach's Alpha reliability coefficient.

Table 2: Mean differences in students' perceived outcomes of TOK study, by year cohort

Perceived TOK Outcome:	No. of items	Mean Score (*SD*)	Comparison of Means (Yr. 11-12)	Cronbach's Alpha (α)
"LifeWorld" Skills	3	Full Cohort: 3.76(*1.36*)	*t*(1231) = 1.81 *p* = 0.70	0.84
		Year 11: 3.71(*1.29*)		
		Year 12: **3.85**(*1.41*)		
Critical Thinking Skills	8	Full Cohort: 4.35(*1.27*)	*t*(1240) = 3.79 *p* < .001*	0.93
		Year 11: 4.23(*1.25*)		
		Year 12: **4.50**(*1.27*)*		

NB: With missing cases eliminated listwise (n = 1242); (*) indicates statistical significance.

Scores for these two variables were examined between year 11 and year 12 students of TOK. As shown in Table 2, the mean scores for perceived "lifeworld" skills fell just under the line of neutrality into disagreement, indicating that, overall, students did not agree that TOK had a direct impact on their "lifeworld" skills as measured by the three items in the survey. The Year 12 mean score (M = 3.85, SD =1.41) was closer to neutral than the mean score of the Year 11 students (M = 3.71; SD = 1.29). Overall scores for the critical thinking variable fell just over the line of neutrality into agreement, with the mean score for the Year 12 cohort (M = 4.50, SD = 1.27) being statistically significantly higher than the Year 11 mean (M = 4.23, SD = 1.25), as shown in Table 2. While both variables demonstrate a gain in perceived utility of TOK in relation to each of these two broad skills as students move from Year 11 to Year 12, it is interesting that, overall, students were in agreement that TOK had led to an increase in their critical thinking skills, whereas the link from TOK content to "lifeworld" skills was less overt or tangible. It was also interesting to note that students' school composition had a statistically significant effect on mean scores for these

two skills, with students from single-sex schools scoring a higher mean score on both perceived TOK outcomes: "lifeworld" skills ($t(1240) = 3.94$, $p < .001$) and critical thinking skills ($t(859) = 6.03$, $p < .001$).

An EFA was likewise employed to evaluate the underlying factor structure of the 14-item *Critical Thinking Strategies Scale* (*CTSS*), designed for use with the current TOK students. As predicted, these 14 items hung together in a single factor representing students' perceived use of critical thinking strategies when confronted with new information. Given that the previously-described measure specifically asked about the impact of TOK on students' skill sets, the wording of this alternative measure intentionally did not specifically link these skills to the TOK curriculum (see Table 3 below). The skills referenced in the survey were drawn from leading measures of critical thinking skill ability (e.g. *The Delphi Report*) and items were measured on a 7-point Likert Scale, ranging from "Extremely Likely" (7) to "Not Very Likely" (1), with an anchor point of "Moderately Likely" (4). Students' mean score on the *CTSS* was 4.73(*SD*=1.08) with a resulting reliability score of 0.94, indicating "excellent" inter-item reliability for the measure. On average, students were more than "moderately likely" to employ a range of critical thinking skills as measured by the *CTSS*.

As with the TOK course outcomes discussed above, students in year 12 reported a statistically significant higher mean score for both the full scale measure, as well as for 11 of the 14 individual items (Table 3). As with the measures of perceived TOK outcomes discussed above, these mean differences also point to a gain in critical thinking skills in the move from Year 11 to Year 12. As a point of clarification, it is worth noting that the data collection methods employed here are unable to definitively point to a causal relationship between students' exposure to TOK and their critical thinking skill development; rather, these skills are likely developed in concert with other aspects of the Diploma Programme.

Table 3: Mean differences in CTSS individual item and full scale scores, by TOK student year cohort

CTSS Measure: Commenced with prompt, "How likely is it that you will…?"	**Year of School**	**N**	**Mean (SD)**	**Comparison of Means (Yr. 11-12)**
Work to clarify meaning and define terms with which you are unfamiliar? (skill 1)	Year 11	630	4.72 (1.45)	$t(1260) = 3.38$* $p < 0.01$
	Year 12	632	**4.99** (1.39)	
Work to understand the significance of the new material to see how it fits with your prior knowledge or experience? (skill2)	Year 11	630	4.60 (1.36)	$t(1260) = 2.05$* $p < 0.05$
	Year 12	632	**4.76** (1.35)	
Express the new question in several ways to clarify its meaning and scope? (skill3)	Year 11	630	4.23 (1.41)	$t(1260) = 3.68$* $p < 0.001$
	Year 12	632	**4.53** (1.46)	
Break the question into sub-questions? (skill4)	Year 11	630	4.36 (1.49)	$t(1260) = 2.44$* $p < 0.05$
	Year 12	632	**4.57** (1.52)	
Seek to identify arguments being made? (skill5)	Year 11	630	4.67 (1.39)	$t(1260) = 3.94$* $p < 0.001$
	Year 12	632	**4.97** (1.37)	
Work to analyse arguments being made? (skill6)	Year 11	630	4.72 (1.39)	$t(1260) = 4.04$* $p < 0.001$
	Year 12	632	**5.03** (1.36)	
Seek to assess claims being made (rather than passively accepting those claims)? (skill7)	Year 11	630	4.73 (1.48)	$t(1260) = 4.70$* $p < 0.001$
	Year 12	632	**5.12** (1.48)	

Imagine alternative ways to solve the same problem? (skill8)	Year 11	630	4.74 (1.46)	$t(1260) = 3.57$* $p < 0.001$
	Year 12	632	**5.03** (1.39)	
Draw conclusions about a problem based on the evidence at hand? (skill9)	Year 11	630	4.90 (1.41)	$t(1260) = 1.61$ $p = 0.25$ (NS)
	Year 12	632	**5.00** (1.46)	
Restrict your claims to those supported by the evidence you have? (skill10)	Year 11	630	4.29 (1.44)	$t(1260) = 0.07$ $p = 0.95$ (NS)
	Year 12	632	4.28 (1.48)	
Search for information that opposes your position as well as information that supports it? (skill11)	Year 11	630	4.66 (1.50)	$t(1260) = 2.37$* $p < 0.05$
	Year 12	632	**4.86** (1.49)	
Consider how your assumptions are shaping your point of view? (skill12)	Year 11	630	4.67 (1.45)	$t(1260) = 2.43$* $p < 0.05$
	Year 12	632	**4.87** (1.48)	
Be able to justify the strategies that you used to solve a problem or create an argument? (skill13)	Year 11	630	4.61 (1.41)	$t(1260) = 2.04$* $p < 0.05$
	Year 12	632	**4.78** (1.43)	
Be able to present your argument to others in a way that they will understand? (skill14)	Year 11	630	4.84 (1.46)	$t(1260) = 1.84$ $p = 0.07$ (NS)
	Year 12	632	**4.99** (1.42)	
Total Score on the 14-item *CTSS*:	Year 11	620	4.62 (1.08)	$t(1240) = 3.04$* $p < 0.001$
	Year 12	622	**4.85** (1.05)	

NB: With missing cases eliminated listwise (n = 1262 for items; n = 1242 for total); (*) indicates statistical significance; NS = non-significant.

Current TOK students were also presented with an additional, previously validated measure of critical thinking in the 5-item *Critical Thinking* subscale (CT subscale) of the "Motivated Strategies for Learning Questionnaire" (MSLQ; Pintrich, Smith, Garcia & McKeachie, 1993). As a leading measure of critical thinking, the CT subscale was chosen to provide an indication of the strength of the original measures developed for the current study. Items in the CT subscale are measured using a 7-point Likert scale, ranging from "Very true of me" (7) to "Not at all true of me" (1), with an anchor point of "Moderately true of me" (4), and participants are presented with hypothetical questions about their use of critical thinking skills. The CT subscale (reliability for the current sample = 0.87) was found to be strongly, significantly correlated with each of the three measures described above (Table 4), highlighting the strength and useability of these original measures to tap into more specific critical thinking/lifeworld skills related to the TOK curriculum.

Table 4: Bivariate Correlations, CT Subscale with 'Lifeworld' Skills, Crit. Thinking Skills, and *CTSS*

	2. CT Skills	3. *CTSS*	4. **CT Subscale**
1. Lifeworld Skills (LW)	0.83*	0.47*	**0.37***
2. Critical Thinking (CT) Skills	-	0.53*	**0.41***
3. *CTSS*	-	-	**0.68***

NB: N = 1242; Pearson's correlation (*r*), 2-tailed; (*) correlations significant at $p < 0.001$

As with the other measures described above, year 12 students' mean score on the CT subscale (M = 4.69, SD = 1.15) was higher than their year 11 counterparts (M = 4.48, SD = 1.22), with students' year level shown to have a significant effect ($t(1240) = 3.04$, $p < 0.01$). While both cohorts of students' scores fell between the anchor point of "Moderately true of me" (4) and the high end of the scale ("Very true of me" [7]), the Year 12 cohort score was moderately closer to the higher end of the measurement scale.

Both students and teachers of TOK were presented with the same set of 14 items in the *CTSS*, although the wording of the teachers' version asked about the extent to which they believed it was likely that their students would utilise each of the 14 critical thinking skills. It is interesting to note that teachers' perceptions of their students' skill use was marginally higher in ten of the 14 skills, indicating that TOK teachers are more prone to imagine that their students will employ critical thinking skills than the students themselves. Nevertheless, none of these differences in means were large enough as to be statistically significant; accordingly, they are not presented here. Sample differences were also examined across multiple states, with no significant mean differences found.

Teachers of TOK were also asked to report on their self-beliefs regarding their ability to teach concepts and skills related to TOK content and outcomes. In order to accomplish this, the *Theory of Knowledge Teacher Self-Efficacy Beliefs Scale (TOK-TSE)*, an original measure, was developed for the purposes of this project. An EFA was conducted to check the underlying factor structure of the items, revealing a single, 14-item factor, with three additional items loading onto a second factor. A close reading of these three items showed their lack of theoretical fit with overall interpretation and, accordingly, the scale was reduced from 17 to 14 items, demonstrating high loadings and excellent internal reliability (Cronbach's alpha = 0.96) Appendix G includes the EFA results including both the original 17 items as well as the reduced, 14-item scale.

Teachers' scores on the *TOK-TSE* were strongly, positively correlated with their perceptions of whether or not their students were able to employ critical thinking skills (teachers' responses to the *CTSS*, as above) as a result of their TOK instruction ($r = 0.65$; $p < 0.001$). While correlational analysis cannot confirm directionality, it seems likely that there is a bi-directional relationship here: teachers' high self-efficacy beliefs around teaching TOK likely have a positive influence on students' TOK skill development, as perceived by their teachers; simultaneously, teachers' perceptions that their students are highly skilled in TOK, likely reinforces the notion that they are skilled teachers of TOK. Nevertheless, knowing that teachers' self-beliefs are a strong predictor of the quality of instruction, it can be hypothesised that teachers with higher *TOK-TSE* are creating more highly skilled TOK pupils.

Qualitative findings:

Discussion of case study findings for RQ#1

The major qualitative themes from our case study research that pertain to RQ#1[10] were:

1. Student learning – this theme covers participants views regarding the development of critical thinking skills through the TOK.
2. Teacher CT design – this theme includes the ways in which teachers have incorporated critical thinking into their TOK lessons.
3. TOK specifics – this theme relates to the ways in which the TOK course, that includes examining knowledge issues and understanding the ways of knowing, helps with critical thinking or otherwise.

Regarding the first of these themes, data collected from the 4 schools suggests there was a belief among some respondents that that the TOK fulfils an important role by complimenting and extending the teaching of CT throughout the DP, for example, through providing students the opportunity to think critically, and also in a longer

[10] Please note that the coded results and qualitative themes for the RQ#1 are reported at the end of this report, under **Appendix J.**

term or global sense, without the pressure of learnt knowledge for examinations. An excerpt from the school 1 teacher transcripts helps to illustrate this belief:

> TOK in conjunction with the other higher level critical skills that are given to students during the IB DP have a huge impact on long term thinking. An ex-student of our school now applies international law to do humanitarian work, and I would like to think that she is still thinking in a different way about her life… It is impossible to isolate TOK in terms of being the major propellant for these types of thinking skills, TOK is a component in a suite of critical thinking attitudes and applications that students take from TOK and the IB DP in general. CT is about taking students a step further, to show how people can help in practical ways to make the world a better place...

At the same time, the research team found that there was different perspectives amongst the case study schools with respect to exactly how to achieve CT skills as a result of TOK. In school 1, the curriculum and learning environment throughout the school (from upper primary onwards) had been altered to support the teaching and learning of CT through TOK. In school 2, there was an internal division between those who believe that the stand alone subject of TOK is the best manner to deliver CT skills and those who felt CT should be integrated across DP subjects. In school 3, a traditional and logical approach had been taken to developing CT skills, that treated TOK philosophically, i.e., as a form of Socratic dialogue, and, in school 4, CT was part of a big picture notion of education that involved the development of well-rounded and highly ethically girls.

With regards to both qualitative themes 1 & 2, an emphasis was placed on encouraging students to think for themselves in every school, though differences were noted in the pedagogic design between schools that would allow independence of thought to happen. For example in school 1, there was a great emphasis on teachers of TOK being pedagogically informed with respect to the connection between CT and TOK by attending IBO workshops. However, in school 2, scepticism was raised by some teachers and administrators with respect to the level of engagement that TOK requires in order to deliver critical thinking skills as a 'stand-alone' course, and with respect to the assessment of CT skills in the TOK outcomes. This questioning of the link between the development of CT skills and TOK is expressed through the following teacher quote from school 2:

> Teachers at our school have been concerned about some of the TOK results. TOK students who have learnt how to write critically, who have English as their first language and find a question that interests them will currently do well in the TOK essay. This does not necessarily mean that they have fully engaged with the TOK course.

In school 3, a strong and coherent picture of the development of CT through independent thought based on propositional logic was expressed by staff, and in school 4, independence of thought was associated with the ability to think critically 'in the world' by the whole school community. With respect to theme 3 ('TOK specifics'), all schools indicated they would value a greater emphasis in TOK documentation on detailing exactly how to deliver CT skills. However, there was also a shared view that it was up to teachers and their chosen pedagogy to steer the class towards good CT practice and to make the TOK curriculum and assessment work in terms of raising the levels of CT.

During our analysis of the case study data other different views about the TOK emerged. All the case study teachers and administration wanted their students to do well in the TOK assessments, as that would add to their IB DP scores, though there seemed to be scepticism as to the precise effects of the TOK course on CT skills, especially in schools 2 & 3. In school 2, a desire to change the current TOK course assessments and include more flexible, formative and discursive assessment was expressed. Contrastingly, as illustrated in Table 5 below, teachers and administrators in school 3 wanted TOK to more closely resemble a logic or philosophy course. In school 1, a deep and penetrating 'inter-twining' between the skills that the IB DP should produce in students as evidenced by IBO documentation, and the skills that were actually taught by the school, had been in process for a number of years. CT as taught through TOK is an essential part of this process and evidence from the case study of school 1 suggests that

the skills of CT are introduced lower down the school in upper primary onwards to allow for and cope with the potential of 'TOK shock', wherein students find it hard to suddenly think for themselves and critically analyse thought. Interestingly, school 4 has taken a similar approach to school 1 in terms of embedding the teaching and learning of CT skills lower down the school, from upper primary onwards, though the staff at school 4 do not identify CT with the subject of TOK as closely as teachers and administrators do in school 1. Two interview excerpts help to provide an insight into the broader view of CT development at school 4, and the more specific identification of CT with TOK at school 1:

> We need to mess with their heads… Our kids are educated in a very linear way. They have to learn to be able to think in a whole lot of different directions, and be able to recognise and value different perspectives. (school 4 teacher)

> TOK provides a course and forum where critical thinking can be learnt through the analysis and manipulation of data, and henceforth, students can be encouraged to use the language of critical thinking in their everyday lives. (school 1 teacher)

Table 5: **Summary of the case study results for RQ#1**

School	Means to deliver CT skills	Links between TOK & CT	**Extent to which TOK delivers CT skills**
1	TOK links; interdisciplinary work; inquiry-based learning; questioning of knowledge assumptions; setting up challenges to conventional knowledge; research-based activities; resources that spark inquiry around knowledge issues; ways of knowing & areas of knowledge	Based around published TOK curriculum and IBO documentation, e.g. analysis of the areas of knowledge and ways of knowing.	The practice of TOK has been aligned with CT in school 1. This is helped by a whole school approach to IBO concepts and curriculum, which are shared, for example, in devotional time.
2	Discussion work; open debates around knowledge issues (for and against); thematic work around knowledge issues; TOK essay writing practice; knowledge as a cultural practice; scientific examination of knowledge	Other specialist subject areas heavily influenced the teaching of CT through TOK, e.g. the examination of evidence in history or the study of rhetoric in English.	CT skills are mainly delivered through the connection between TOK and other subjects such as history, English and science.
3	Logic; philosophical debate; detailed specialist knowledge about CT; analysis of philosophical arguments (i.e. premise/conclusions); teaching of philosophical methods, e.g. Socratic dialogue; TOK journal writing	CT linked primarily to philosophy and logical argument. TOK therefore is conceived as a means to improve CT through close examination of how to argue logically.	The focus on CT skills as a traditional aspect of philosophy in school 3 means that the subject of TOK has been moulded in this light. The subject of TOK is a subset of philosophical studies.
4	'Lifeworld' discussions; ethics; specific linguistic preparation for TOK assessments; publication of TOK work; introduction to university-style CT skills; links to CAS issues/debates; teaching thinking routines	TOK has been embedded within a whole-school approach to CT. TOK sessions are therefore an opportunity to focus and improve CT skills learnt elsewhere and to link to subjects such as psychology.	The delivery of CT skills were a central part of the school's mission to encourage critical thinking & independent girls. The TOK course was an aspect of this bigger picture school ethos.

In sum, the four case study schools were able to interpret the TOK course to fit in with their own visions of what education is and how it should be organised. School 1 have tried to model this vision very closely on the published IBO perspective, whereas teachers and administrators at schools 3 & 4, which are both single-sex schools, have their own, perhaps more traditional approaches, which modifies how CT skills are delivered through and by the TOK course, according to context and to their particular over-arching traditions. In contrast, school 2 is in transition, with the new staff associated with TOK looking to more closely match the teaching and learning in TOK with CT, while others continue to leave CT to the specialist knowledge areas. In school 2, where the IB DP is offered without

the support lower down the school of the MYP and the PYP, CT is still largely being delivered through subject specialists. School 1 offered the pre-IB DP courses of the PYP (Primary Year Programme) & the MYP (Middle Years Programme), which can prepare students very specifically for TOK, CT and higher order thought.

Lastly, consistent with the survey results, Diploma students expressed mixed views about the role of the TOK in supporting the development of CT skills. The following quote captures how some students valued the TOK while others focused more on its role in contributing to their final IB DP score.

> I've noticed that the TOK course is almost framed as an optional course for some students, in that if you don't really want to participate that's seen as OK. Some students shut out taking part in TOK altogether, as it is only worth a couple of points on their final IB DP score. However, students also think that the critical thinking skills embedded in the TOK course will help with every IB DP subject, and that it is a core aspect of the IBO mission to make students independent learners who can make our own minds up about important issues.

RQ#2: What is the relationship between participation and/or performance in TOK and external measures of critical thinking at postsecondary level?

Quantitative Findings:

In order to investigate the second research question with a cohort of first year university students, former TOK DP students (n=99) were compared to non-TOK-DP students (n=290) on two measures of critical thinking skills, the *CCTDI* (see Appendix C, Part B) and the 7-item *Self-Efficacy for Critical Thinking Scale (SECT;* see Appendix C, Part B, Section Two, Item #13*)*. An EFA was employed to assist in reducing the 7-item *SECT* into a single factor for use as a summed scale in further analysis (Appendix H). The EFA showed that these 7 items did hang together as a single factor, with a Cronbach's reliability score of 0.75. Accordingly, the summed mean, measured on a 4-point Likert scale from "Very Confident" (4) to "Not at all Confident" (1), was used in all further analysis.

Former TOK-DP students reported higher scores on the *SECT* (mean = 3.30, *SD* = 0.38) than their non-TOK-DP peers (*SECT* mean = 3.08, *SD* = 0.44), indicating that former TOK-DP students were more confident about their ability to use critical thinking skills than the students from non-TOK-DP secondary schools. This difference was found to be statistically significant ($t(380) = 4.59$, $p < 0.001$). Regrettably, the total sample size of university students dropped considerably as participants were asked to move from the UWS-hosted survey instrumentation (Appendix C, Part A) to the externally-hosted, Insight Assessment website – the commercial site hosting the pay-per-use *CCTDI* instrumentation (Appendix C, Part B). This drop off in participants was likely due to the necessity for students to move from one website to another during the data collection process and enter login details in order to access the commercial instrument, for which a finite number of paid access points were available. Accordingly, for analysis using the *CCTDI* measure, the sample of former-TOK-DP university students dropped to 42 and the sample of non-TOK-DP university students dropped to 126. The representative nature of the associated findings is thus impacted.

Scores on each of the *CCTDI* subscales can range from 10 to 60, with the Insight Assessment testing group, the commercial providers of the measure, providing assessment categories of Low (10-29), Ambivalent (30-40), Positive (40-50) and High (50-60). Further, the CCTDI Testing Manual stresses the point that scores can also be linked to age, with younger individuals (e.g. undergraduates) being more likely, on average, to score lower (Facione & Facione, 2010).

With regards to the *CCTDI*, the mean scores for each of the seven subscales as well as the overall total score were higher for the former TOK-DP university students (Table 6), despite the former TOK-DP sample of young people being, on average, nearly 1.5 years younger than the non-TOK-DP sample (mean age, former TOK-DP sample = 18.38

years; mean age, non-TOK-DP sample = 19.79 years). A t-test was used to compare mean scores across each of these outcomes, with a significant difference found for only one of the subscales, "Confidence in Reasoning" ($t(166) = 2.02$, $p < 0.05$). Former TOK-DP students scored in the Positive range (between 40 – 50), or very nearly Positive (e.g. mean "Systematicity" score = 39.74), for six of the seven subscales, with only "Truth-Seeking" falling into the high end of the Ambivalent range (see Appendix B, Part C for full definitions of these traits).

Table 6: Mean differences on the *CCTDI* for Former TOK-DP and Non-TOK-DP university students

	Former TOK-DP Student?	Mean (SD)
Truth-Seeking	Yes	**37.02**(5.88)
	No	35.00(6.33)
Open-Mindedness	Yes	**43.48**(5.41)
	No	42.85(5.42)
Inquisitiveness	Yes	**48.17**(6.45)
	No	46.96(6.35)
Analyticity	Yes	**44.95**(5.39)
	No	44.75(5.02)
Systematicity	Yes	**39.74**(6.59)
	No	38.91(6.78)
Confidence in Reasoning	Yes	**45.93**(5.96)
	No	43.75(6.12)
Maturity of Judgement	Yes	**41.98**(7.06)
	No	41.90(6.35)
CCTDI Total Score	Yes	**300.95**(30.05)
	No	293.98(27.75)

NB: Former TOK-DP students (n = 42); Non-TOK-DP students (n = 126)

The top three dispositional traits for former TOK-DP students were Inquisitiveness (e.g. intellectual curiosity), Confidence in Reasoning (e.g. the tendency to trust the use of reason and reflective thinking to solve problems) and Analyticity (e.g. the habit of striving to anticipate both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans). Further, the largest mean differences between the two cohorts was in the dispositional areas of Inquisitiveness, Confidence in Reasoning and Truth-seeking (e.g. working not to let bias or preconception colour the search for knowledge and truth).

In order to gauge the predictive power of students' completion of the TOK curriculum on measures of critical thinking, a series of hierarchical regression analyses were conducted, using both the *CCTDI*, including each of its sub-scales (n = 130), as well as the *SECT* (n = 313) as dependent variables. Students' demographic details, including whether or not they were born overseas (measured as a dichotomous variable), their age, and their sex, were entered as step 1 of the regression. Their parents' highest levels of education (as a proxy measure of socio-economic status) were entered as step 2 (mother) and step 3 (father). Given the categorical nature of these two measures, each response option was dummy-coded for the purposes of the regression analysis, as can be seen in Table 7. Step 4, the final step in the regression model, included TOK completion as a dichotomous variable (yes/no).

While the full regression model including all four steps did not have adequate fit for any of the eight related *CCTDI* measures (e.g. neither the full measure nor any of the seven subscales), the model showed good fit using the *SECT* as the dependent variable ($\beta = .26$, $t(300) = 4.56$, $p < .001$; see Table 7). These six variables accounted for 10% of the total variance in students' reported *SECT* scores ($R^2 = 0.10$, $F(12, 300) = 2.70$, $p < .01$). Of greatest interest for the current study, when students' completion of the TOK course was added to the predictive model, it accounted for an additional 6% of the variance of students' *SECT* score, or more than half of the total variance accounted for by the model in its entirety ($\Delta R^2 = 0.06$ for Step 4, $p < .001$). These findings indicate that while students' CCDTI scores were not significantly predicted by their completion of the TOK course (likely due to a combination of low numbers of

CCDTI completions as well as mean sub-cohort differences too small to register as statistically significant), *SECT* scores were significantly predicted by TOK completion. This is a salient finding, not only because of the amount of overall variance explained, but also given the very large number of potential predictors of this outcome. Given the sheer number of factors that might influence students' self-efficacy beliefs around critical thinking, it is notable that TOK completion had a measureable impact of this magnitude. Given the strong, predictive links between domain-specific self-efficacy beliefs and measureable academic outcomes in that domain (see Pintrich & Schunk, 2002 for a review), this finding reinforces the notion that TOK course completion likely leads to measureable gains in students' critical thinking skills via enhanced self-efficacy beliefs in the area of critical thinking. An important caveat to these results, however, is that students who have completed the TOK course have also completed the full DP course, of which TOK is a single component. As such, it is impossible to say unequivocally whether students' *SECT* scores were predicted specifically by TOK completion or more broadly by completion of the DP.

Table 7: Regression of Participant Demographic Variables and TOK Completion on *SECT* Measure

	B	SE B	Beta	*P*	*R*	R^2	ΔR^2
Step 1					**.096**	**.009**	**.009**
Constant	3.33	.18		.00			
Born	-.03	.06	-.03	.64			
Age	-.01	.01	-.05	.39			
Sex	-.08	.05	-.08	.15			
Step 2					**.120**	**.014**	**.005**
Constant	3.30	.20		.00			
Born	-.03	.06	-.03	.65			
Age	-.01	.01	-.05	.41			
Sex	-.07	.05	-.08	.16			
MTAFE	-.01	.08	-.01	.94			
MBnM	.03	.07	.03	.69			
MPhD	.06	.14	.03	.67			
MProf	.16	.15	.07	.27			
Step 3					**.186**	**.035**	**.020**
Constant	3.40	.21		.00			
Born	-.01	.06	-.02	.79			
Age	-.01	.01	-.05	.35			
Sex	-.07	.05	-.08	.18			
MTAFE	-.01	.08	-.01	.94			
MBnM	.08	.07	.09	.27			
MPhD	.10	.15	.05	.48			
MProf	.16	.16	.07	.33			
DTAFE	-.04	.09	-.03	.68			
DBnM	-.17	.08	-.19	.03			
DPhD	-.11	.11	-.07	.32			
DProf	-.07	.14	-.04	.62			
Step 4					**.312**	**.097**	**.063****
Constant	3.27	.20		.00			
Born	-.03	.05	-.03	.54			
Age	.00	.01	-.02	.66			
Sex	-.07	.05	-.08	.16			
MTAFE	-.04	.08	-.03	.66			
MBnM	.04	.07	.05	.56			
MPhD	.05	.14	.02	.74			
MProf	.06	.16	.02	.72			
DTAFE	-.02	.09	-.02	.82			
DBnM	-.15	.08	-.17	.05			
DPhD	-.12	.11	-.08	.26			
DProf	-.07	.14	-.03	.64			
TOK	.26	.06	.26	.00			

Note: N = 313; Dependent variable: *SECT*; ** $p < .001$.

Born = Australian/Overseas Born; MTAFE/DTAFE = Mother's/Father's TAFE Completion; MBnM/DBnM = Mother's/Father's Bachelors or Masters Completion; MPhD/DPhD = Mother's/Father's PhD Completion; MProf/DProf = Mother's/Father's Professional Degree Completion; TOK = TOK Course Completion

RQ#3: To what extent do the learning outcomes of the TOK course impact student learning in other IB DP subjects and core courses (i.e., extended essay) as perceived by teachers and students?

Quantitative Findings:

Teacher Survey

While research question three was not a particular focus of the survey data collection, there were several items in the TOK Teacher survey (see Appendix B, Section Three) which spoke to the connection between the TOK curriculum and other areas of secondary students' study. In particular, teachers were invited to choose from a list of potential "purposes" of TOK, and asked to select as many as they believed to be relevant purposes (survey item #24). Two of these purposes highlighted the links between TOK and learning in other DP subjects: one outlining "connections between academic disciplines" and another examining students' preparation "for future learning." Of the five options available to teachers, it is perhaps worth noting that these two options were the least likely to be selected.

Further, two additional items related to teachers' perceptions of 1) the most challenging skill to teach students (survey item #30); and 2) the most enjoyable aspect of the TOK curriculum for students (survey item #28) incorporated a response choice of, "identifying connections between the TOK content and content studied in other courses." While TOK teachers rated this response option as the *least challenging skill to teach*, it also featured as the *least enjoyable aspect of TOK content* from their perspective.

An additional open-ended question asked teachers about how they see TOK as relating to other areas of the curriculum (survey item #35). Data from the 61 individual responses to this item (accounting for 73% of respondents) were collapsed into several overarching themes linking to TOK and other subject content knowledge (particularly philosophy and critical exploration of knowledge) and TOK/non-TOK teachers' role in enabling subject integration. The six themes for TOK's relationship to other subject areas as named for the purposes of this qualitative data reduction were: (1) knowing how to know; (2) teachers' role in connection of TOK to other DP subjects; (3) philosophical understanding that underpins all disciplines; (3) building new understanding; (4) critical thinking skills; (5) integration into other curriculum; (5) learning methodology of other disciplines; and (6) TOK naturally links to some DP areas better than others. In particular, teachers described how the underpinning of the TOK curriculum, specifically including critical thinking skills, philosophical understandings, and a focus on "knowing" as an active process, was fundamentally linked to other content areas in the Diploma Programme. Moreover, teachers saw how the content of the TOK curriculum naturally lent itself to integration with other subjects and had strong feelings that it *should* be linked to other subjects, specifically due to TOK's focus on the "hows" of knowing. For example, one teacher pointed out:

> I challenge the students to ask their teachers about the assumptions and level of truth in their courses. TOK is essential for getting a deeper and more effective appreciation of their other subjects.

Responses given for the open-ended question also alluded to why a teacher may or may not make those cross-curricular connections, specifically noting the necessity for all teachers to be on-board with establishing connections, as it is beyond the scope of the TOK teacher to take responsibility to do so on his/her own. One respondent referred to this as the "duty of all teachers" to expose connections between TOK and other IB DP and core courses. Teachers named other curricular areas where they saw a natural fit with TOK as including: the Extended Essay; Creativity, Action and Service; "human sciences" (psychology, social and cultural anthropology), and

economics. As another teacher put it, “If you think about the ‘why’ of any curriculum area, you are in the world of TOK.”

Qualitative Findings:

Discussion of case study findings for RQ#3

The major qualitative themes that emerged from the case study component of our research concerning RQ#3[11] were:

1. Teacher proficiency – this theme relates to the teacher’s ability to use TOK in their lessons.
2. Curriculum organisation – this theme reflects the school’s organization of the curriculum, and how this can add or detract from the TOK content of IB DP lessons.
3. Student meta-cognition – this theme is connected to the student’s ability to reflect on their learning.

Regarding the first two themes, school 1 have made a concerted effort over many years to train teachers across the IB DP subject specialist areas in order to engage them with and use the concepts of TOK in their everyday teaching and learning environments. This effort has resulted in teachers across the IB DP from school 1 being comfortable with TOK and being able to implement specific TOK teaching and learning strategies in their classrooms. For example one teacher commented:

> TOK has a big impact on the visual arts. We specifically ask the students to go to the TOK course and bring back ideas for their visual arts portfolio.

In school 2, a new group of TOK teachers and a new TOK administrator is attempting a parallel exercise to school 1, though they are experiencing resistance from subject specialists who are perhaps less willing to change their pedagogic approach and to fit in ‘TOK moments’ to their specialist subject area studies. A TOK moment is, for example, when a teacher of history is able to drill down into the evidence for a knowledge claim, and name that exercise as pertaining to the theory of knowledge. Interestingly, students have nonetheless identified these moments in DP specialist subjects:

> I have not heard other subject teachers reporting a positive impact of TOK. (However) I regularly have students reporting ‘TOK moments’ in their subjects where they either recognise the approach of the subject or ask TOK style questions, i.e. finding knowledge issues regarding what they are being taught. (school 2 teacher)

In school 3, a consistent, whole school approach to teaching ‘correct’ thinking skills throughout the curriculum has aligned the specific subject of TOK amongst the staff with the school’s emphasis on being able to use philosophy, logic, Socratic dialogue and the strengthening of student argumentation in their lessons. This sustained practice throughout the school community means that teachers, administrators and students from school 3 were able to articulate the connection between TOK and other IB DP subjects through logic and philosophy. An example from a teacher transcript from school 3 provides an insight into this approach:

> Logic is a big one. Yeah, I think Logic… That’s the hardest one I think… It was the hardest one for me to teach…initially not having had that background in formal of Logic, in that it was probably one of the units that did require…along I think with Ethics the most work. That was one that did need a little bit more direct instruction… teaching them about syllogisms and teaching them about fallacies and so forth… Logic has a big impact on the boys’ essay writing and thinking… (school 3 teacher)

[11] Please note that the coded results and qualitative themes for the RQ#3 are located at the end of this report, under **Appendix K**

In school 4, a broad, whole school approach to teaching the girls to think critically and creatively for themselves about life issues, has meant that the relationship between TOK and other IB DP subjects goes beyond the confines of student essay writing or the formal ability to argue logically, and into what it means to study and to apply knowledge to the world. The following quote highlights the complex inter-relationship between TOK and other IB DP subjects in school 4:

> Well, I think that the impact of TOK on other IB DP subjects and vice versa depends on the teacher's approach and interests; for example, if you include current events in your lessons, and you know my background has been building students as enquirers, and being knowledgeable, but also being, you know, critical thinkers… And, having an interest in History and Geography and current events in English, that's given me a broad foundation to draw on in terms of perspectives, and my methodology probably since… the early nineties… has been very much, you know, student-centred and collaborative, and about thinking routines and skills, so it was quite a natural sort of fit for me to take that kind of approach with the teaching of Theory of Knowledge. (school 4 teacher)

As can be seen above, the themes that we identified of 'teacher proficiency' and 'curriculum organisation' are highly interconnected, and relate to the ways in which each school community has taken up and attempted to infuse TOK methodology amongst other IB DP staff and subjects over time. The impact of TOK on other IB DP subjects as articulated by the four schools depended on the conduit between TOK and other subject specialisms. In school 1 this conduit has been built upon IBO documentation, in school 2, there was a block between teachers concerned about improving TOK outcomes and those who were not, in schools 3 & 4 the conduit between TOK and the other IB DP subjects has been facilitated by their whole school approaches to developing thinking skills.

Our analysis of the case study data also drew out several important differences in the student cohorts regarding how TOK is interpreted as a learning tool. As noted on the previous page, the research team named this theme as being about 'meta-cognition' or the students' ability to think about their learning (Theme 3). Students who participated in the focus groups in school 2 especially took on the challenge of thinking through the consequences of applying TOK curriculum and methods across the curriculum, with students actively 'taking sides' in the debate. On one side of the debate, some students pointed to the benefits of TOK in other IB DP subjects areas such as being pushed to inquire deeply into knowledge claims, and to not take on knowledge superficially. On the other side of the debate, students argued that the application of TOK across the curriculum could lead to the unnecessary scrutiny of knowledge. This social discursive practice led to positive and negative opinions being expressed with respect to the relationships between TOK and the other subject areas by the student focus groups in school 2. As a result, the discussions about the place and impact of TOK in the curriculum in the school 2 focus groups were focused and lively, for example an argument given in favour of TOK was:

> TOK is a grown up way of discovering the world through rounded learning engagement and the full articulation of knowledge problems across the curriculum.

Conversely, criticisms levelled at TOK included:

> TOK can lead to people focusing too much on the grey zone of knowledge. There are black and white zones in knowledge and **we just have to accept that**. TOK can 'pander to idiots' in that the endless questioning modes that it encourages can turn you away from confronting what is right and what is wrong, and having moral resolve in basic matters such as life and death…

In contrast, the student focus group discussions with respect to RQ#3 in the other schools were at times less robust, particularly if students thought they were being asked to respond in a universally positive manner; i.e. only speaking positively about the effects of TOK across the IB DP curriculum. Nonetheless, the meta-cognitive aspect of research question 3 was summarised by a student in school 1, who described the place of TOK in the curriculum as constituting a 'double-edged sword'. This metaphor can be explained by reference to the amount of work that IB DP

students have to complete over the 2 years of the study and the amount of time this work requires, and this concern was expressed by student focus groups in all schools. If students take the TOK mode of thought too seriously, they could become lost in the universal questioning mode, possibly leading to procrastination, and would not be able to complete all the assignments necessary to pass the IB DP course. An opinion also expressed through the student focus groups was that TOK could lead to some students thinking too broadly in inappropriate areas such as science or maths. Similarly, a qualitative research finding was that teachers and administrators of the IB DP have to balance the requirements of the strenuous IB DP pre-tertiary course, with the need to devote sufficient time to the study of TOK, so that students could properly understand both TOK and the 6 subjects that have to complete. Indeed, it was noted that teachers should take care not to judge students who resist the impact of TOK across the curriculum, because it is likely that these students are still grappling with the new knowledge and methods of the specialist areas, and are not yet ready to manipulate knowledge in a fluent, TOK style. With these types of issues in mind one teacher directed this suggestion to the IB,

> I would like to see more active construction of the TOK course in terms of the subject areas, and more engagement with learner profiles and how the kids actually learn across the whole of the IB DP. The IBO needs to be proactive in terms of training teachers in the IB DP subjects to be able to deploy TOK for the benefit of their courses, and in examining the methodologies and relationships between the different courses. It is not good enough to increasingly add to the workloads of the teachers and the students in the attempt to raise standards without understanding how this extra work impacts on the classroom experience…

RQ#4: What are students' and teachers' perceptions toward the TOK course (i.e., learning engagement, effort, perceived benefits, challenges, and factors of success)?

Quantitative Findings:

In addition to learning about teachers' perceptions of the TOK course, we were also interested in teachers' self-beliefs around the teaching of TOK content and skills. The *TOK-TSE* scale (see Appendix B, Section Two) measured teachers' self-efficacy beliefs with regards to specific TOK teaching (sample item: "I am confident that I can teach conceptual and abstract thinking"). Responses were measured using a scale of 0% to 100%, ranging from "Not at all Confident" (0%) to "Absolutely Confident" (100%), and rescaled to a range of 0 – 10 for easier interpretation of results. Teachers were examined on this variable by sub-group analysis, including by state, gender and school-type (single-sex vs. co-educational) but there were no statistically significant differences dependent on these demographic variables.

Examination of each of the 14 items in the *TOK-TSE* scale revealed little variation in responses, with mean scores ranging from 7.89 (or 78.9% confident) to 8.94 (or 89.4% confident). Teachers' mean scores were highest on the three items related to critical thinking ["Get students to think critically and question knowledge"; Mean = 8.94 (1.44)], questioning assumptions ["Help students to question assumptions in learning in the TOK classroom"; Mean = 8.81(1.71)] and acknowledging interconnected systems ["Help TOK students realise that systems are connected"; Mean = 8.73(1.55)]. Interestingly, teachers' lowest self-efficacy scores were related to the area of assessment, with using "various assessment strategies" [Mean = 7.89 (1.84)] and "gauging student comprehension" [Mean = 8.01 (1.81)], ranked lowest of the 14 items. Taken as a whole, the results suggest that teachers generally appeared confident teaching the TOK subject matter.

However, as would be logically expected, teachers' years of experience, both teaching in general and teaching within the TOK course were significant predictors of their *TOK-SE* scores (Table 5). Hierarchical regression analysis was used to examine the predictive power of teachers' experience on their self-beliefs as measured by the *TOK*-SE. These two categories of years of experience (total & TOK) together explained nearly 50% of the variance in

teachers' self-efficacy beliefs regarding teaching TOK (R^2 = 0.49, $F(1, 78) = 12.00$, $p < .001$). In order words, almost 50% of the proportion of variance in teachers' self-efficacy beliefs with regards to teaching TOK could be explained by their total lifetime teaching years and total years of teaching the TOK curriculum. As shown in Table 5, when looking at Step 2 of the regression model, a one-year increase in teachers' total lifetime years of teaching would yield a 0.40 increase in their predicted *TOK-SE* score, or nearly a half-point increase. Likewise, a one-year increase in teachers' total years of teaching TOK would yield a 0.30 increase in their predicted *TOK-SE* score.

Table 8: Regression of Teaching Experience on *TOK-SE*

		B	*SE B*	B
Step 1	(Constant)	6.08	.64	
	Total lifetime years of teaching	.56	.14	.41*
Step 2	(Constant)	5.97	.62	
	Total lifetime years of teaching	.40	.15	.29*
	Total years of teaching TOK	.30	.11	.29*

NB: R^2= 0.41 for Step 1, ΔR^2 = 0.07 for Step 2 ($p < .001$). * $p < .001$.

Survey Open-Ended Responses

Several items on the TOK Teacher survey (see Appendix B, Section Three) addressed teachers' perceptions of the TOK course and help to illuminate the TOK-TSE results. Teachers were asked about the extent to which they believed their school valued the TOK course (survey item #44). This open-ended question elicited 69 individual responses (83% of the total survey participants). Of these, 31 responses were overwhelmingly positive, where teachers felt that the course and content were valued by the other members of staff. Amongst these responses, teachers were likely to refer to the centrality of the TOK course to the rest of the DP and a general recognition that the TOK course content assisted students with other areas of learning (e.g. "The school values it greatly – the critical thinking skills that are developed are recognised as being invaluable"). A subset of responses also specifically outlined the positive impact of student participation in TOK on their Diploma Score (e.g. "It (TOK) appears to be the difference between our students scoring in the low 40's as opposed to the mid 40's"), a finding which also links to RQ#3.

On the other hand, 16 responses were negative in nature, reflecting the perception that other members of staff, as well as school leadership staff, did not see the importance of the course (a finding more in line with some of the case study results, as detailed in the following section). This was reflected in comments about staffing of TOK, where several participants commented about issues such as untrained TOK staff, sharing of classes, and lack of co-ordination available for the TOK course (e.g. "Staffing is hindered as it is a last priority often"). Others outlined that while they might have one fellow staff member supportive of TOK, either a deputy or curriculum co-ordinator, other teaching staff did not see the value in TOK as a subject in its own right (e.g. "I think many subject areas understand it poorly and see it (TOK) as an unnecessary imposition on their already crowded curriculum").

TOK teachers were also asked specifically about how other staff members at their school perceived the TOK course (survey item #45). This item elicited 71 independent responses (accounting for 86% of survey respondents) with a wide mixture of sentiments included therein. While a small group of TOK teachers indicated strictly positive staff perceptions (n = 13; sample response: "That it (TOK) is an interesting and valuable course"), the larger majority indicated mixed responses or an indication that staff perceptions were improving as the school progressed in its integration of TOK (n = 24; sample response: "Mixed – some would like to teach it, others would hate to teach it"). Of the remaining items, a noteworthy thread of responses (n = 19) described a sense of 'mystery' surrounding the TOK course amongst non-TOK staff, specifically describing a lack of understanding about TOK and the perception

that it was an "odd" or "peculiar" subject (e.g. "Many teachers are not clear on the nature of the course. TOK teachers frequently need to demystify the course for students, teachers and parents").

Of those who described negative staff perceptions (n = 14), many suggested that other staff members did not want to teach TOK due to perceptions of a larger teaching load (preparation and marking, in particular) and a sense that it wasn't "worth it" due to the small contribution to the overall IB grade. Further, others in this grouping outlined colleagues' perceptions that TOK was "scary" and "bothersome" in that it presented additional requirements that spread into other courses within the Diploma Programme.

Qualitative Findings:

Discussion of case study findings for RQ#4

The major qualitative themes that emerged from the four case studies schools for research question 4[12] included:

1) Teacher reflexivity
2) Student focus
3) School atmosphere

Research question 4, regarding student and teacher perceptions toward the TOK course, was highly suited to qualitative research and generated a wide range of responses. To help with the analysis of the case study qualitative data, the three themes of 'teacher reflexivity', 'student focus' and 'school atmosphere' were decided upon by the research team as explicative themes to organise individual perceptions of TOK. 'Teacher reflexivity' was decided upon as it summarises the ways in which TOK could be perceived both positively and negatively by teachers. Meanwhile, the thematic category 'student focus' was seen as providing a suitable means for explaining student's perceptions of TOK. Finally, 'school atmosphere' is an important theme as we felt this identified a significant influence on the perceptions of TOK in the case study schools.

In terms of the teachers' perceptions of TOK, all 4 schools had teachers who perceived TOK positively and some who perceive it negatively. Positive comments from teachers attributed a host of learning benefits to the delivery and execution of TOK, such as the heightened intensity in student thinking, increased motivation to understand knowledge, the improvement of creative and critical thinking, and a better and more thorough openness to new thought. Negative comments were directed towards the vagueness of TOK, the lack of content in the TOK curriculum, the assessment of TOK and the overall broad focus of TOK. Such views are summarised in Table 9, and by the following two quotes taken from a teacher at school 1 and another at school 2.

> In terms of teachers reactions to TOK, there are teachers who ridicule TOK and make a joke about it along the line that 'you are going to do some deep thinking about nothing in TOK', and there are teachers who never teach TOK and have nothing to say about it. Some teachers have reacted negatively to having to integrate TOK into their classrooms because they don't have time to make the 'TOK links', and this is 'practical scepticism'. (School 1 teacher)

> What I think that we are doing in TOK is giving the students the vocabulary to name what they might be doing anyway in terms of thinking processes and handling knowledge issues. TOK is a process of bringing to conscious ideas that which might be already embedded in their lives, but they have never had to formally express what these ideas are as young learners. One of the biggest challenges is to engage the students in the first place with the subject of TOK in terms of understanding what it is and why it could be important. But when this has been achieved, it is

[12] Please note that the coded results and qualitative themes for the RQ#4 are reported at the end of this report, under **Appendix L.**

> great to just let the class go and to run with the ideas and discussion that come from the class as they are empowered to being able to speak about these TOK ideas. (school 2 teacher)

Table 9: Positive and negative teacher perceptions of TOK in the case study schools:

School	Theme	**Positive perception**	**Negative perception**
1	1, 2 & 3	TOK is integrated into everything that we teach (also relevant to RQ#3)	
1	1 & 3	TOK is part of our devotional programme	
1, 2	1, 2		TOK is very difficult to fully assess
1, 2	1		Many staff are sceptical about the benefits of TOK
1	1, 2	TOK is a forum to discuss citizenship	
2	1,2		TOK essay writing can be an especially hard skill to master
2, 3	1	Some teachers really enjoy contesting the knowledge that they teach	
2	1,2	TOK is like discovering a natural thinking process	
3	1		Some teachers can find it hard to understand the appropriate pedagogy for TOK
3	1, 3		TOK should be more connected to CAS (this perception is also appropriate for RQ#3)
4	1, 2	Good TOK sessions model good thinking for the students	
4	1,2	Good TOK lessons make knowledge problems more tangible for the students	

Students also held varied perceptions of TOK, which are summarised in Table 10. Positive student comments from the four schools included the suggestion that TOK had significantly helped with the students' IB DP study in terms of giving them insight into various knowledge issues and being able to analyse data more effectively by encouraging them to question the nature of the knowledge. For example, students offered remarks such as:

> The aim of TOK is to open up your mind. It is an extremely important skill to be able to see the world through another's point of view. I think that TOK encourages and allows you to do this through questioning and through developing empathy for others. I think that the development of multiple knowledge perspectives is at the heart of TOK and what makes for a successful learner.

Negative perceptions from students focussed on the over-reliance on vague and circular discussion work that can happen in TOK classrooms, as well as the lack of relevance and purpose of some of the sessions. Students also commented on the challenging ways in which TOK could be framed and delivered and how this could negatively impact on their learning because they may have misunderstood the objectives of the lessons.

> I think that we thoroughly analyse knowledge claims in the subject areas anyway, so having extra TOK sessions is really a waste of time. I think that TOK seems to value any point of view on knowledge, whereas in the real world there are definitely some ways of knowing that are more highly prized than others, e.g. in the hard sciences and in business. I am not sure if the TOK sessions interact with the other subject areas as much as they should.

Table 10: Positive and negative student perceptions of TOK in the case study schools

School	Theme	**Positive perception**	**Negative perception**
1	2		Some students do not want to construct their own knowledge
1	2		Students who only want the right answer do not do well at TOK
1	2		Some students are not mature enough to appreciate TOK
1	2	Understanding a knowledge problem can be very satisfying	
1,2	2		It is hard for us to always know what the focus is in TOK
2	2		TOK can very hard to understand at the start of the course
2	1,2	TOK can give students a life skill	
2	1,2	TOK has helped me to be a 'truth seeker'	
2	1, 2	TOK has helped to give me greater academic confidence through questioning knowledge	
2, 4	1,2 & 3		Student engagement can be a problem in TOK lessons
4	2		TOK can be frustrating because I am constantly being taken out of my comfort zone
4	1, 2		TOK can be great to discuss but impossible to put down on paper
3	2		Opening up in TOK can also make you more gullible
3, 4	2	TOK has allowed me to analyse my life experiences in a new light	

When participant perceptions of the TOK at each case study school are compared with the school's implementation of TOK, an interesting picture emerges concerning the influence 'school atmosphere'. As has been mentioned above, in the case study findings for RQ# 1 & RQ#3, school 1 has taken a concerted approach to building the profile of IB DP course and TOK in particular, according to IBO publications and throughout the school. Perceptions towards TOK are therefore enhanced through and by the school atmosphere at school 1. In contrast, in school 2, where the effects of TOK presently have a lower presence on campus, though are clearly very important for the new TOK teachers and the IB DP students, perceptions of TOK are somewhat less positive. In schools 3 & 4, perceptions of TOK had been aligned with a particular take on the subject that has been framed through a whole school approach to CT. School 3 favoured a philosophical, logical approach to TOK, school 4 perceived TOK to be along the lines of 'reflexive thinking'; i.e. thinking about thinking. In sum, the lively mix of perceptions towards TOK that were found in the four case study schools mirrored the ways in which the course has been framed by the schools.

RQ#5: What is the relationship between performance in TOK and postsecondary success (i.e., GPA or other measures of student performance; continuation; graduation)?

Quantitative Findings:

To address research question 5, we asked first year university students to provide information on three additional indicators of postsecondary success: their (1) ATAR (Australian Tertiary Admission Rank) score; (2) a 10-item scale measure of general academic self-concept (*ASC*; Marsh, 1992); and (3) a 6-item indicator of their perceived university outcomes (see Appendix C for all measures). The second measure, academic self-concept, was

drawn from a previously-validated, widely-used measure ("Academic Self-Description, General" scale from the Self-Description Questionnaire II [SDQII]; Marsh, 1992), used in the current analysis as a summed scale. Items here measured students' self-beliefs regarding their academic ability and outcomes (sample item: "I am good at most academic subjects"). The *ASC* scale, measured using an 8-point Likert scale, ranging from "Definitely False" (1) to "Definitely True," (8) was found to have strong inter-item reliability for the current sample (Cronbach's alpha = 0.88).

The six items measuring perceived university outcomes asked students to indicate how much they agree or disagree with a list of hypothetical outcomes (sample item: "During my study, I will need to repeat a unit of study because I failed it(R)"). These items were measured on a 4-point scale ranging from "Strongly Agree" (4) to "Strongly Disagree" (1). While initial exploratory factor analysis (EFA) determined a two-factor solution, the resultant reliability coefficient for the one-factor solution (Cronbach's alpha = 0.78) was preferable to a two-factor solution (Cronbach's alphas = 0.77 & 0.68, for factors one and two, respectively). Accordingly, the one-factor solution was preferred for parsimony and interpretability of the resultant factor (see Appendix I).

Mean scores for former TOK-DP students (here called "DP Graduates") and non-TOK-DP students ("Non-DP Graduates") were compared on these three measures. The DP graduates out-scored the non-DP graduates on each of these measures of postsecondary school success. On each of the three measures, differences between mean scores of the two groups were statistically significant (Table 11). These findings point to tangible impact of completion of the DP curriculum, including the TOK course, on students' university readiness and access to competitive courses, as well as their own personal perceptions of their academic ability and their future university successes.

Table 11: Mean differences in ATAR, ASC & Perceived University Outcomes, by cohort

Measure	Secondary School	N	Mean (*SD*)	Comparison of Means
ATAR Score	DP Graduate	94	**94.13**(6.79)	$t(290) = 4.76$*
	Non-DP Graduate	267	89.29(12.07)	$p < 0.001$
General Academic Self-Concept (10-item scale)	DP Graduate	99	**6.25** (0.96)	$t(380) = 4.24$*
	Non-DP Graduate	283	5.75 (1.02)	$p < 0.001$
Anticipated University Outcomes (6-item scale)	DP Graduate	99	**3.43** (0.43)	$t(380) = 2.25$*
	Non-DP Graduate	283	3.32 (0.47)	$p < 0.001$

NB: (*) indicates statistical significance

As an additional indicator of the relationship between performance in TOK and students' postsecondary outcomes, correlational analysis was used to examine the amount of covariance between students' reported TOK essay mark (ranging from Grade A to Grade E) and each indicator described above. Analysis revealed only a single significant relationship pairing, between students' TOK essay mark (converted to a 5-point scale) and their critical thinking self-efficacy, as measured by the *SECT*; however, the strength of this relationship was low ($r = 0.22$, $p < 0.05$).

In order to gauge the predictive power of TOK success on later outcomes, a series of hierarchical regression analyses were performed using students' demographic data as well as their reported mark on the TOK essay as independent variables and several postsecondary outcomes (ATAR score, *SECT* score, general academic self-concept, and anticipated university outcomes) as dependent variables (n = 71). Models were structured as presented previously in RQ #2, with students' demographic details including whether or not they were born overseas, their age, and their sex, entered as step 1 of the regression. Participants' parents' highest levels of education (as a proxy measure of socio-economic status) were entered as step 2 (mother) and step 3 (father), with step 4 representing the addition of their TOK essay mark, measured as a scale variable ranging from 1-5 (Grade A = 30-40 (5); Grade B = 23-29 (4); Grade C = 17-22 (3); Grade D = 11-16 (2); Grade E = 0-10 (1)).

While the full regression model including all four steps did not have adequate predictive power for students' ATAR score, their general academic self-concept or their perceived university outcomes, the model did show good predictive fit using the *SECT* measure of self-efficacy beliefs on critical thinking as the dependent variable. These six variables (students' place of birth, age, sex, mother's and father's level of education and TOK essay mark) accounted for 26% of the total variance in students' reported *SECT* scores (R^2 = 0.26, $F(12, 60) = 1.76$, $p < .05$). Of greatest interest for the current study, students' successes in TOK (measured via their reported TOK essay mark) was a statistically significant predictor of their *SECT* scores ($\beta = .27$, $t(60) = 2.33$, $p < .05$), accounting for an additional 7% of the variance in this measure (ΔR^2 = 0.07 for Step 4, $p < .05$). Accordingly, every one unit increase in students' reported TOK essay mark (e.g. from Grade B to Grade A, for example) would yield a 0.27 increase in their predicted *SECT* score.

Furthermore, a series of hierarchical regression analyses using the same initial three steps as above were conducted, with the fourth step modified to reflect whether or not the student had completed the TOK course. Unlike the previous analysis, these regression models were able to include the larger sample of the DP graduates, including both former TOK-DP and non-TOK-DP students (n = 294). It is important to preface these findings by again noting that students who have completed the TOK course have also completed the full DP course, of which TOK is a single component. As such, it is not possible to separate TOK completion as a predictor without including the related predictive value of the Diploma Programme in its entirety.

Students' completion of the TOK course was found to be a statistically significant predictor, above and beyond students' sex, age, SES, and country of birth, of these three measures of postsecondary success. TOK completion was a statistically significant predictor of students' reported ATAR score ($\beta = .19$, $t(281) = 3.10$, $p < .05$), accounting for an additional 3% of the variance in this measure (ΔR^2 = 0.03 for Step 4, $p < .01$). TOK completion was also a statistically significant predictor of students' general academic self-concept ($\beta = .24$, $t(293) = 4.07$, $p < .001$). It is noteworthy that of the total model explained variance (almost 9%; R^2 = 0.86, $F(12, 293) = 2.29$, $p < .01$), TOK completion accounted for more than half of this (ΔR^2 = 0.05 for Step 4, $p < .001$). Thirdly, TOK completion was a statistically significant predictor of students' perceived university outcomes ($\beta = .11$, $t(281) = 1.98$, $p < .05$), despite accounting for just a very small portion of the additional explained variance in this measure (ΔR^2 = 0.02 for Step 4, $p < .05$).

Lastly, an additional step was added to the regression analyses presented in the findings associated with Research Question #2 in an effort to ascertain the predictive power of the sample's three most influential measures of university success on TOK students' reported *CCDTI* score. Accordingly, step 5 of the regression model was added to include students' self-efficacy beliefs on critical thinking (*SECT*), their academic self-concept and perceived university outcomes. While as a predictor variable in step 4, students' TOK completion did not predict their *CCTDI* scores, TOK completion did, in fact, predict the three measures of postsecondary success, as described above and in an earlier section of the findings (RQ #2). Further, regression analysis showed that these three measures entered together as step 5 (*SECT*, general academic self-concept, and perceived university outcomes) added excellent predictive power to the current model (R^2 = 0.46, $F(15, 120) = 8.50$, $p < .001$), explaining nearly 40% of the variance in students' *CCTDI* score (ΔR^2 = 0.39 for Step 5, $p < .001$). It is of particular interest that, in the current model, the other six predictors, including students' demographic characteristics accounted for merely 4% of the model variance on their own.

With these findings in mind, it stands to reason that there is an indirect relationship between students' completion of the TOK course (and the DP course, more generally) and their critical thinking dispositions as measured by the *CCTDI.* It appears that completing the DP, of which the TOK course is a foundational element, enhances students' academic self-concept and other positive self-beliefs about their ability to succeed in a postsecondary setting and that these positive self-beliefs, and their associated confidence, are strongly linked to students' willingness to think critically.

Out of interest, the research team also investigated university students' intake data from their own institution, the University of Western Sydney, looking for mean differences in ATAR scores amongst the cohort of incoming students in each of three years: 2011, 2012 and 2013. Of the 19,460 incoming students over these three years, 51 of these were DP graduates who had, in all likelihood, completed the TOK course. A comparison of means (Table 12) indicated that former DP students had a higher average ATAR score (M = 84.69, *SD* = 10.81) than their non-DP counterparts (M = 65.33, *SD* = 12.18).[13] While the statistical significance of the difference in mean group scores was calculated, this is likely affected by the extreme difference in sample size and t-test results should be interpreted with caution.

Table 12: Mean differences in ATAR for UWS Intake Data, by Cohort

Intake Year	Secondary School	N	Mean ATAR Score (*SD*)	Comparison of Means
2011	DP Graduate	9	**95.37**(1.40)	$t(1252) = 7.45$
	Non-DP Graduate	1245	65.54(12.00)	$p < 0.001$
2012	DP Graduate	28	**82.08**(10.00)	$t(13093) = 7.18$*
	Non-DP Graduate	13067	65.46(12.24)	$p < 0.001$
2013	DP Graduate	14	**83.06**(12.00)	$t(5091) = 5.63$*
	Non-DP Graduate	5079	64.92(12.04)	$p < 0.001$

Survey Open-Ended Responses

An open-ended item with the TOK Teacher survey (see Appendix B, Section Three, survey item #34) addressed teachers' perceptions regarding the impact of the TOK course on students' later lives. Of the 83 teacher participants, 70 individual teachers provided a response to this item (representing 84% of all respondents). Responses/Comments provided by teachers on future university study were overwhelmingly positive. Within these 70 responses, several key themes regarding the ways in which TOK benefits students were outlined by teachers. Each of the themes is outlined in Table 13, accompanied by an illustrative quote.

Table 13: Teachers' Perceptions of the Impact of TOK on Students' Later Lives

Theme:	TOK Teacher Representative Quote(s):
Positive impact on critical thinking skills	"It [TOK] models/establishes an inherent enquiry-based attitude towards learning and knowledge" "[TOK improves] their ability to think critically and consider multiple perspectives."
Teaching students to challenge accepted viewpoints/appreciate different viewpoints	"There is no other subject that directly addresses an overview of life and worldview issues like TOK. They will have their over confidence in the Western construction of the disciplines undermined and a sound framework established for future learning that critiques knowledge."
Encouraging independent, lifelong learning	**"**It (TOK) becomes a way of viewing the world - a life habit."
Encouraging self-reflection and meta-learning	"The broad ranging discussion seems to lead to thinking about life choices and ways of living." "It (TOK) promotes self-examination and metacognition as well as meta-learning."

[13] A bootstrapping method was used to account for the extreme difference in sample size between the two participant subgroups.

Conclusion and Recommendations

The following section provides a summary of the results for each question and concludes with a list of recommendations.

RQ#1: To what extent do students develop critical thinking skills/higher order thinking skills as outcomes of their participation in the TOK course?

Quantitative findings revealed apparent gains between the two successive years of TOK (years 11 and 12) in TOK students' reported endorsement of TOK as useful and relevant (see pages 20-22 for a description of TOK Student Survey, Section Two and the included measurements). Further, TOK students completing their second year of the DP reported a higher likelihood of using an array of critical thinking skills, with particular gains related to analysing an argument and assessing knowledge claims. These findings point to students' development of critical thinking skills over the duration of the TOK study.

TOK teachers rated their students' critical thinking strengths more favourably than students' self-reports, with teachers' ratings linked strongly to their self-efficacy beliefs with regards to teaching TOK. It appears that teachers' high self-efficacy beliefs around teaching TOK likely have a positive influence on students' TOK skill development, as perceived by their teachers; simultaneously, teachers' perceptions that their students are highly skilled in TOK likely reinforces the notion that they are skilled teachers of TOK. Knowing that teachers' self-beliefs are a strong predictor of the quality of instruction, it is likely that teachers with higher *TOK-TSE* are developing more highly skilled TOK pupils.

Case study data demonstrated that all four participating schools would value additional TOK documentation detailing how exactly to enhance their students' critical thinking skills, while simultaneously agreeing that it was up to teachers and their pedagogy to steer the TOK students towards good critical thinking practice. A related issue was that schools appeared to hold different opinions concerning what critical thinking skills are and how they should be taught. With regards to the enhancement of critical thinking skills, some schools endorsed introducing critical thinking skills in the earlier years of schooling (from upper primary onwards), in order to avoid the possibility of 'TOK shock,' wherein students find it hard to suddenly think for themselves, as TOK requires. Schools also noted that TOK assessments could do much to raise critical thinking content and skills amongst students.

RQ#2: What is the relationship between participation and/or performance in TOK and external measures of critical thinking at the postsecondary level?

Comparing a sample of former TOK students and non-TOK students at the university level revealed significantly higher self-beliefs with regards to critical thinking skills within the cohort of students who had completed the TOK course. Further, TOK course completion was found to be a significant predictor of these self-beliefs, even after controlling for students' age, gender, SES status and country of birth. Former students of TOK also scored significantly higher on an external measure of critical thinking, the California Critical Thinking Dispositions Inventory (CCTDI), particularly with regards to the skills of inquisitiveness and confidence in reasoning.

RQ#3: To what extent do the learning outcomes of the TOK course impact student learning in other DP subjects and core courses (i.e., extended essay) as perceived by teachers and students?

Explicit connections between TOK and other areas of the IB DP varied across the four case study schools, with some schools making shared knowledge of TOK a whole-school priority, especially amongst IB DP staff, while others reported non-TOK teachers' resistance to engaging with TOK content and pedagogical approach. A related suggestion offered by one interviewee was for the IB to be '*proactive in terms of training teachers in the IB DP subjects to be able to deploy TOK for the benefit of their courses'*. Meanwhile, DP students at the four schools held mixed views of the connection between the TOK and other curriculum areas. Some students indicated that the TOK helped students to inquire deeply into knowledge claims in other subjects, and to not take on knowledge superficially. However, others commented that if TOK is taken too seriously it may lead to unnecessary scrutiny of knowledge, and could potentially cause students to think too broadly in inappropriate areas such as science or maths.

Findings from the teacher survey revealed that making the links between TOK and other areas of the IB DP curriculum was the least selected option of five potential purposes of TOK, and was least likely to be selected by TOK teachers as an enjoyable feature of TOK. Responses given to survey open-ended questions alluded to why a teacher may or may not make cross-curricular connections, specifically noting the necessity for all teachers to be on-board with establishing connections, as it is beyond the scope of the TOK teacher to take responsibility to do so on his/her own. Lastly, curricular areas that were perceived to have a natural fit with TOK included: the Extended Essay; Creativity, Action and Service; "human sciences" (psychology, social and cultural anthropology), and economics.

RQ#4: What are students' and teachers' perceptions toward the TOK course (i.e., learning engagement, effort, perceived benefits, challenges, and factors of success)?

Overall, teachers reported high self-beliefs with regards to teaching TOK, with self-beliefs being linked to their overall years of study as well as the number of years they had taught in the course. Teachers reported feeling most confident about their own ability to assist students in developing critical thinking skills and less confident about assessment tasks.

Teachers provided a nuanced picture of their colleague's perceived value of the TOK course. On one hand, teachers reported the sense that it provided significant learner benefits and value to the school, particularly with regards to enhancing students' overall marks. However, teachers also reported that other members of the school community viewed TOK content as too broad and not worth prioritising in the school, with other staff members exhibiting reluctance to teach in TOK due to a perceived larger teaching load and the difficulty of the work.

Students' perceptions appeared equally spilt. While they acknowledged that the content and associated critical work of TOK assisted with success in other areas of study, students also described an over-reliance on classroom discussion, some of which had little perceived relevance.

RQ#5: What is the relationship between performance in TOK and postsecondary success?

First year undergraduate students who had completed the DP, of which the TOK curriculum is a core element, obtained higher average ATAR scores than their non-IB counterparts at the conclusion of their secondary study, allowing more freedom of choice for university entry. Further, former-TOK students

outscored non-IB university students on measures related to their self-appraisals of postsecondary success: their academic self-concept as well as their anticipated university outcomes regarding marks and completion. With regards to critical thinking skills as a measure linked to postsecondary successes, former-TOK students' performance in TOK, as measured by their reported TOK essay mark, was found to be a significant predictor of their self-efficacy beliefs for critical thinking skills at the university level, even after controlling for various demographic variables linked to postsecondary successes (e.g. SES; country of birth).

Further, evidence pointed to an indirect relationship between students' completion of the TOK course and their critical thinking dispositions as measured by the *CCTDI.* It appears that completing the TOK course enhances students' academic self-concept and other positive self-beliefs about their ability to succeed in a postsecondary setting and that these positive self-beliefs, and their associated confidence, are strongly linked to students' willingness to think critically. TOK teachers felt that the TOK course would have a strong, positive impact on their students' later life, especially with regards to examining multiple viewpoints and functioning as reflective, lifelong learners.

In conclusion, the research team extensively discussed the research findings, and came to the following recommendations as a summation and extension of the findings that are based on the evidence and experience of the research project:

1) **Skilling all IB DP teachers in the specific teaching of critical thinking. For example, developing specific focuses for the integration of critical thinking in lesson plans.**
2) **Enabling structured class discussion of knowledge problems through the supply of high quality stimulus materials and TOK thinking guides that indicate how best to use this material. Further, the publication of 'TOK friendly' texts for classroom use.**
3) **Developing a more detailed understanding of how students can progress in their critical thinking skills over the course of the TOK sessions. A specific TOK schema could be commissioned, researched and consequently used for this purpose together with more precise TOK descriptors in assessment support materials.**
4) **Instituting concise and well-constructed formative methods of assessment for TOK and the critical thinking skills necessary for IB DP success. For example, the use of TOK 'thinking diaries' with goals, timelines, challenges, strategies.**
5) **Enabling the development of TOK formative learning criteria based on achievable yet ambitious TOK learning scales and the analysis of learnt critical thinking skills.**
6) **Introducing strategies for the introduction of TOK thinking and learning strategies before year 11, especially across year 10 as a preparation to the IB DP. This strategy would be especially pertinent in schools that do not run the MYP.**
7) **Developing international networks through the IB schools, which analyse and discuss knowledge problems from a variety of political, cultural and social perspectives. This recommendation could relate to the 'connected classroom' second language learning environment.**
8) **Starting a student-led publishing journal or academic blog for TOK and critical thought between schools, countries and continents.**
9) **Encouraging all IB DP teachers to be critical thinkers about contemporary knowledge issues in their fields of expertise through regular workshops hosted by the IB, international teacher meetings and mediated electronic networks for CT.**
10) **Providing an easy to access and understand guide to the benefits of TOK for non-IB DP teachers and all members of IB schools.**
11) **Developing clearly identified TOK goals within CAS and the extended essay as added criteria for assessing these core areas of the Diploma.**
12) **Analysing the critical thinking skills of students on entry to the TOK course in year 11, and using this baseline data for the specific development of critical thinking skills that respond to the learning needs of particular cohorts.**

Limitations

It is possible that those who have chosen to participate in this study may be those who have had exceptional TOK experiences (e.g. both highly positive and strongly negative), providing a limited picture into more average students and teachers of TOK. Further, due to the year-long timeframe of the project, a longitudinal study is not possible. Accordingly, while we are able to gauge the strength and significance of particular relationships within the data and speculate about the causal nature of key variables, no solid cause-effect outcomes have been reported.

For the sample of university participants, while the two-cohort model provides a better understanding of how non-DP and former TOK-DP students differ by key outcomes, obtaining a true matched sample was not possible. As such, there is always the possibility that a variety of non-measured variables are responsible for any between-sample differences. Further, given that students in this sample have been enrolled at university for at least one month at the time of data collection, it is also possible that the university experience might have an impact on their development of critical thinking skills dispositions, above and beyond the impact of TOK participation (for former TOK students). Nevertheless, our choice of multivariate data analysis provides insight into differences explained by students' cohort membership.

Further, due to unforeseen difficulties and shifts in the project starting date, we were unable to get access to a sample of TOK students at the conclusion of the 2012 school year. We had initially intended to follow these students through to university by way of providing a larger sample of former-IB DP students. In lieu of this, participant recruitment for the university sample has been focused on universities and courses with large concentrations of former IB DP students.

Lastly, rather than measure university students' actual critical thinking skills, we have opted to ascertain perceptions of their critical thinking skills *dispositions*, as a proxy measure of ability and employment of skills. We see this as a preferable choice, both in terms of positive impact on completion rates (a particularly salient issue, given the shift in sampling frame, as above) as well as in actual evidence of skills. It is our belief that, without strong external motivation, it is unlikely that students, including those with strong critical thinking skills, would complete an onerous test of university-level critical thinking skills. Given the motivational links between positive emotional/affective response and task completion, we see less adept students as likely to opt-out or randomly complete a test of critical thinking skills, ultimately invalidating results from this phase of the data collection. In contrast, a measure of dispositions is far less burdensome for participants, and provides a positive affective experience through interpretive feedback upon completion. We believe that, without any clear 'right' and 'wrong' responses, participants will be more likely to answer honestly, providing a more valid measure of their critical thinking skills and abilities. Furthermore, self-report measures of ability, unlike actual measures of skill, are far less affected by participant fatigue and less subject to variation.

Nevertheless, an additional limitation relates to the location of the *CCTDI* measurement on an external website. As this is a commercial measurement, it was located on the organisations' private, external URL which meant that university student participants were required to move between websites to complete their data collection. As such, 58% of participants were 'lost' in the move, making for a much smaller sample of complete cases (e.g. participants who had completed both the *CCTDI* and all other measures selected for this study).

There are various limitations characteristic of qualitative case studies, in particular that the findings associated with each school, and to this sample of NSW IB DP schools in Australia, will have limited generalizability to other schools and locations, however the rich detail of the pedagogical effects and perceptions of TOK in these IB DP schools has been illuminating. The case studies do not have predictive value, as cohorts of students and to a lesser extent the configurations of TOK teachers at each school tend to change from year to year. Nevertheless, deeper understanding of how TOK is integrated within the ethos and culture of particular IB schools has been possible. An additional constraint of the case study method is that although a large quantity of field data is generally collected, the capacity of researchers to represent that detail is limited. Accordingly in this study, within the timeline for reporting, the most common elements and the most distinct differences between schools in relation to TOK, critical thinking and higher education has been our focus. Finally, ensuring anonymity is always difficult with case studies and the relatively small numbers of schools delivering IB DP in NSW will mean that schools may be more readily recognisable than in larger data sets. This will not impede the research or limit findings however in an intensely competitive educational market there may be a risk that one of the participating schools might perceive their case, relative to other schools, as an impediment to success or as potentially impacting on reputation. However the sampling strategy should ensure that the four schools are not in direct competition with each other – two Catholic schools enrol only boys or girls and are in quite different locations, and the two co-educational schools are widely separated geographically. Competition with the state educational sector is not relevant as currently no NSW state schools offer the IB DP within their senior school.

References

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management*, *38*, 9-44.

Boyatzis, R.E. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, London & New Delhi: SAGE Publications

Byrne, B., & Worth Gavin, D. (1996). The Shavelson model revisited: Testing for the structure of academic self-concept across pre-, early, and late adolescents. *Journal of Educational Psychology, 88*(2), 215-228.

Coates, H., Rosicka, C., MacMahon-Ball, M. (2007). Perceptions of the International Baccalaureate Diploma Programme among Australian and New Zealand Universities. Canberra: Australian Council for Educational Research

Cole, D. R. (2005). An examination of Hegelian and Spinozian Philosophy and their relationships with the International Baccalaureate subject, Theory of Knowledge. *Journal of Research in International Education, 4*(2), 211-226.

Creswell, J.W. & Plano-Clark, V.L. (2011). *Designing and Conducting Mixed Methods Research, 2nd Edition.* SAGE Publications: Thousand Oaks, CA

Doherty, C. (2009). The appeal of the International Baccalaureate in Australia's educational market: a curriculum of choice for mobile futures. *Discourse: Studies in the cultural politics of education*. 30(1), 73-90.

Doherty, C. (2012). Optimising meritocratic advantage with the International Baccalaureate Diploma in Australian schools. *Critical Studies in Education*. 53(2), 183-196.

Facione, P.A. (1990). "The Delphi Report"- Executive Summary. Fullerton, California. California University Press.

Facione, N.C. & Facione, P.A. (1997). *Critical Thinking Assessment in Nursing Education Programs: an Aggregate Data Analysis.* Millbrae, California: California Academic Press, 92–3.

Facione, P.A., Facione, N.C., & Giancarlo, C.A. (2010). *California Critical Thinking Disposition Inventory Test Manual*, California Academic Press, Millbrae, CA.

Facione, N.C., Facione, P.A. & Sanchez, C.A (1994). Critical thinking disposition as a measure of competent clinical judgement: The development of the California Critical Thinking Disposition Inventory. *Journal of Nursing Education, 33*(8), 345-350.

Gan, A. (2009). Chinese students' adjustment to the International Baccalaureate Diploma program. *Journal of Research in International Education, 8*(3), 283-304.

Gazda-Grace, P. (2002). "Psst...Have you heard about the International Baccalaureate program?". *The Clearing House, 72*(2), 84-87.

Gibbs, G. R. (2002). *Qualitative Data Analysis: Explorations with NVivo*. Buckingham: Open University Press.

Greene, J.C., Kreider, H., & Mayer, E. (2005). Combining Qualitative and Quantitative Methods in Social Science. In B. Somekh & C. Lewin (Eds.), *Research Methods in the Social Sciences* (pp. 274-283). London: Sage.

Hoy, W. K., & Woolfolk, A. E. (1993). Teachers' sense of efficacy and the organizational health of schools. *Elementary School Journal, 93,* 355-372.

IB (International Baccalaureate Organization (2006). Diploma Programme: Theory of Knowledge Guide. Cardiff: International Baccalaureate Organization.

Insight Assessment (2000). California Critical Thinking Dispositional Inventory Web site at: http://www.insightassessment.com/Products/Critical-Thinking-Attributes-Tests/California-Critical-Thinking-Disposition-Inventory-CCTDI

Lincoln, Y., & Guba, E. (2009). The only generalization is that here is no generalization. In R. Gomm, M. Hammersley & P. Foster (eds.) *Case Study Method.* Thousand Oaks: Sage.

Luke, A. (2000). Critical literacy in Australia. *Journal of adolescent and adult literacy.* Vol. 43, (No. 2), 11-26.

Martin, A. & Marsh, H. (2006). Academic resilience and its psychological and educational correlates: A construct validity approach. *Psychology in the Schools, 43*(3), 267-281.

Marsh, H. W. (1992). Self-Description Questionnaire (SDQ) III: A theoretical and empirical basis for the measurement of multiple dimensions of late adolescent self-concept. An interim test manual and research monograph. Macarthur, New South Wales, Australia: University of Western Sydney, Faculty of Education

Marsh, H.W. & Craven, R.G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science, 1*(2), 133-163.

McCarthy, P., Schuster, P., Zehr, P. & McDougal, D. (1999). Evaluation of critical thinking in a baccalaureate nursing program. *Journal of Nursing Education, 38*(3), 142-144.

Merriam, S.B. (1988). *Case study research in education: A Qualitative approach*. San Francisco: Jossey-Bass.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, *66*, 543-578.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research, and Applications* (2nd ed). Columbus, OH: Merrill-Prentice Hall.

Pintrich, P., Smith, D., Garcia, T., & Mckeachie, W. (1993). Reliability and predictive ability of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53*, 801- 813.

Saldaña, J. (2009). *The Coding Manual for Qualitative Researchers*. SAGE Publications: Thousand Oaks, CA.

Schunk, D. H., & Meece, J. L. (2006). Self-efficacy development in adolescence. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 71-96). Greenwhich, CT: Information Age Publishing.

Scriven, M. & Paul, R. (2008) Defining Critical Thinking, *Foundation for Critical Thinking*. Available at: http://www.criticalthinking.org/aboutCT/definingCT.cfm

Smith, N. V., & Morgan, M. (2010). Politics and pedagogy: Discursive constructions in the IB Theory of Knowledge-Guide. *The Curriculum Journal, 21*(3), 299-312.

Tacq, J. (1997). *Multivariate Analysis Techniques in Social Science Research: From problem to analysis.* SAGE Publications: Thousand Oaks, CA.

Tiwari, A, Lai, P., So, M. & Yuen, K. (2006). A comparison of the effects of problem-based learning and lecturing on the development of students' critical thinking. *Medical Education, 40,* 547-554.

Tschannen-Moran, M., Woolfolk Hoy, A. & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68,* 202-248.

Van Gelder, T. (2005) Teaching Critical Thinking: Some lessons from cognitive science, *College Teaching*, 53, pp. 41–46.

Walsh, M. (2003). Teaching qualitative analysis using QSR NVivo. *The Qualitative Report, 8* (2) 251-256. Retrieved 18/06/2012 from http://www.nova.edu/ssss/QR/qr8-2/walsh.pdf.

Wangensteen, S., Johansson, I.S., Bjorkstrom, M.E. & Nordstrom, G. (2010). Research utilisation and critical thinking among newly graduated nurses: predictors for research use. A quantitative cross-sectional study. *Journal of Clinical Nursing 20,* 2436-2447.

Yang, Y.C. & Chou, H. (2008). Beyond critical thinking skills: Investigating the relationship between critical thinking skills and dispositions through different online strategies. *British Journal of Educational Technology, 39*(4), 666-684.

Yin, R. K. (2009). *Case study research: Design and methods*. SAGE Publications: Thousand Oaks, CA.

Zemplen, G. A. (2007). Conflicting agendas: Critical thinking versus science education in the International Baccalaureate Theory of Knowledge Course. *Science & Education, 16,* 167-196.

Zimmerman, B. J., & Kitsantas, A. (2005). Homework practices and academic achievement: The mediating role of self-efficacy and perceived responsibility beliefs. *Contemporary Educational Psychology*, *30*, 397-417.

Appendices

Appendix A: Survey for current students of Theory of Knowledge (Years 11 & 12)

"Understanding Theory of Knowledge" (Student Survey)

Understanding Theory of Knowledge

Dear International Baccalaureate Student,

We would like to invite you to participate in a research study being conducted by the University of Western Sydney in cooperation with the International
Baccalaureate Organisation (IBO), entitled "Theory of Knowledge (TOK): Exploring learning outcomes, benefits, and perceptions."

The purpose of this survey is to investigate the subject of TOK in your school and how TOK enables critical thinking skills. Your responses will help us understand how TOK is working in your school and what you think about your own critical thinking skills. It will take about 20 minutes to complete this survey.

Your answers will only be seen by the researchers and will not be shown to anyone in your school, so please answer each question honestly. The research team will not report the names of students or schools that participate in the study. A report of the findings may be submitted for publication but individual participants and your school will not be identifiable.

Your participation is entirely voluntary. You may stop taking this survey at any point without penalty. It is not anticipated that participating in this project will involve any discomfort.

This study is being sponsored by the International Baccalaureate Organisation, with in-kind support from the University of Sydney. This study has been approved by the University of Western Sydney Human Research Ethics Committee. The approval number is: H9892.

If you have any questions, you may contact Associate Professor David Cole on (02) 4736 0154. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee at UWS by email at: humanethics@uws.edu.au.

Thank you for taking the time to participate. Your participation is much appreciated!!

1. I have read and understood the above information and consent to participate in this project.
   Yes

   No

2. Today's Date

DD MM YYYY

☐ ☐ ☐

3. Are you sure you would like to exit the survey?

- No
- Yes

Section One: About You

4. What is your gender?

- Male
- Female

5. What year of high school are you in?

- Year 11
- Year 12

6. Which state/territory is your high school in?

- Australian Capital Territory
- New South Wales
- Victoria
- Queensland
- South Australia
- Western Australia
- Tasmania
- Northern Territory

7. Which high school do you attend in ACT?

- Narrabundah College
- Melba Copland Secondary College
- The Canberra College
- Canberra Girls Grammar School
- Other (Please specify)

8. Which high school do you attend in NSW?

- Australian International Academy - Sydney Campus
- Elonera Montessori School
- German International School Sydney
- Kambala
- Lycee Condorcet - The lnternational French School of Sydney
- MLC School
- Monte Sant' Angelo Mercy College
- Newington College
- Penrith Anglican College
- Queenwood School for Girls
- Ravenswood School for Girls
- SCECGS Redlands
- St. Andrew's Cathedral School
- St. Paul's Grammar School
- Trinity Grammar School-Sydney

- Other (Please specify)

9. Which school do you attend in NT?
- Kormilda College Limited
- Other (Please specify)

10. Which school do you attend in VIC?
- Australian International Academy of Education
- Geelong Grammar School
- Haileybury
- Ivanhoe Grammar School
- Kardinia International College
- Lauriston Girls' School
- Macedon Grammar School
- Methodist Ladies' College
- Presbyterian Ladies' College Melbourne
- Sophia Mundi Steiner School
- St. Leonard's College
- The Kilmore International School
- Tintern Schools
- Werribee Secondary College
- Wesley College, Melbourne
- Other (Please specify)

11. Which school do you attend in WA?
- The Montessori School
- Scotch College
- Presbyterian Ladies' College - Perth
- Treetops Montessori School
- International School of Western Australia
- Other (Please specify)

12. Which school do you attend in SA?
- Carey Baptist Grammar School
- Concordia College
- Glenunga International High School
- Mercedes College
- Pembroke School
- Prince Alfred College
- St Peter's Collegiate Girls School
- St. Peter's College
- Walford Anglican School for Girls
- Woodcroft College
- Other (Please specify)

13. Which school do you attend in TAS?
- The Friends’ School
- Other (Please specify)

14. Which school do you attend in QLD?
- Cairns State High School
- Indooroopilly State High School
- John Paul College

- Mountain Creek State High School
- Queensland Academy - Science Mathematics and Technology
- Queensland Academy for Creative Industries
- Queensland Academy for Health Sciences
- Somerset College
- St. Peters Lutheran College
- Townsville Grammar School
- Trinity Lutheran College
- Other (Please specify)

15. Is your school

- Single sex
- Co-Educational

Section Two: Theory of Knowledge (TOK)

Thinking specifically about the Theory of Knowledge curriculum and course content. The following questions ask how much you agree or disagree with the each of the statements by using the scale from 1 to 7. 1 indicates "strongly disagree" and 7 indicates "strongly agree".

Please select the response that best represents your opinion.

16. Do you agree or disagree with the following…?

	(1) Strongly disagree	(2)	(3)	(4) Neither agree nor disagree	(5)	(6)	(7) Strongly agree
The content of TOK has helped me solve everyday problems.	●	●	●	●	●	●	●
Taking TOK has taught me how to think critically before passively accepting new information.	●	●	●	●	●	●	●
Taking TOK has not really helped to make me a more informed member of society.	●	●	●	●	●	●	●
Since taking TOK, I am better able to form my own ideas about new information.	●	●	●	●	●	●	●
I think about things in a deeper way since taking TOK.	●	●	●	●	●	●	●
Since taking TOK, I am more likely to recognise and question my assumptions about particular ideas or topics.	●	●	●	●	●	●	●
Since taking TOK, I have become better at constructing logical arguments.	●	●	●	●	●	●	●
I have not excelled at my work in TOK.	●	●	●	●	●	●	●
In TOK, I have learned how to approach a difficult question by looking at smaller, related questions.	●	●	●	●	●	●	●
TOK is excellent preparation for living in the real world.	●	●	●	●	●	●	●
I have gotten quite good at seeing multiple answers to complex problems since taking TOK.	●	●	●	●	●	●	●
TOK has helped me strengthen my ability to think logically during everyday decision-making.	●	●	●	●	●	●	●
TOK has taught me how to theorise.	●	●	●	●	●	●	●

Section Three: How you see yourself as a student

Imagine you are confronted with new knowledge – a new problem or question involving subject matter with which you are completely unfamiliar.

Reference scale [1-7] represents the level of likelihood that you will be able to complete each task or process presented in the list below. 1=Not very likely and 7=Extremely likely. Please select the number that best represents your opinion.

17. How likely is it that you will…?

	(1) Not very likely	(2)	(3)	(4) Moderately likely	(5)	(6)	(7) Extremely likely
Work to clarify meaning and define terms with which you are unfamiliar?	●	●	●	●	●	●	●
Work to understand the significance of the new material to see how it fits with your prior knowledge or experience?	●	●	●	●	●	●	●
Express the new question in several ways to clarify its meaning and scope?	●	●	●	●	●	●	●
Break the question into sub-questions?	●	●	●	●	●	●	●
Seek to identify arguments being made?	●	●	●	●	●	●	●
Work to analyse arguments being made?	●	●	●	●	●	●	●
Seek to assess claims being made (rather than passively accepting those claims)?	●	●	●	●	●	●	●
Imagine alternative ways to solve the same problem?	●	●	●	●	●	●	●
Draw conclusions about a problem based on the evidence at hand?	●	●	●	●	●	●	●
Restrict your claims to those supported by the evidence you have?	●	●	●	●	●	●	●
Search for information that opposes your position as well as information that supports it?	●	●	●	●	●	●	●
Consider how your assumptions are shaping your point of view?	●	●	●	●	●	●	●

	(1) Not very likely	(2)	(3)	(4) Moderately likely	(5)	(6)	(7) Extremely likely
Be able to justify the strategies that you used to solve a problem or create an argument?	●	●	●	●	●	●	●
Be able to present your argument to others in a way that they will understand?	●	●	●	●	●	●	●

The following statements describe what and how you will do things in your study. The scale [1-7] is a reference for you to select how true each statement describes about you. 1=Not at all true of me and 7=Very true of me. Please select the number that best matches you opinion.

18. How "true of you" are each of these statements?

	(1) Not at all true of me	(2)	(3)	(4) Moderately true of me	(5)	(6)	(7) Very true of me
I often find myself questioning things I hear or read to decide if I find them convincing.	●	●	●	●	●	●	●
I believe I'm mentally tough when it comes to exams.	●	●	●	●	●	●	●
When a theory, interpretation, or conclusion is presented in class or in readings for school, I try to decide if there is good supporting evidence.	●	●	●	●	●	●	●
I think I'm good at dealing with schoolwork pressures.	●	●	●	●	●	●	●
I treat learning material as a starting point and try to develop my own ideas about it.	●	●	●	●	●	●	●
I don't let a bad mark affect my confidence.	●	●	●	●	●	●	●
I don't let study stress get on top of me.	●	●	●	●	●	●	●
I try to play around with ideas of my own related to what I am learning at school.	●	●	●	●	●	●	●
Whenever I read or hear an assertion or conclusion in school, I think about possible alternatives.	●	●	●	●	●	●	●
I'm good at bouncing back from a poor mark in my school work.	●	●	●	●	●	●	●

Section Four: Schooling and the "Real World"

Think about the relationship between all of your school learning (not just TOK) and your life outside of school, both now and into the future.

19. How important is successful study to your career goals and future plans?

	(1) Not at all important	(2)	(3)	(4) Moderately important	(5)	(6)	(7) Extremely important
Importance of successful study	●	●	●	●	●	●	●

Can you say a bit more about your answer? In what ways is study important or why isn't it important?

20. What do you see as being the purpose of study? (Select all that apply)

- ☐ Knowing more about interesting topics and/or gaining useful skills
- ☐ Doing well in order to succeed later in life
- ☐ Preparation for exams
- ☐ Pleasing teachers, parents/caregivers, or other adults

21. Of these four choices, which motivates you to study most of all?

- ● A belief that you are able to do well.
- ● A belief in the importance of school.
- ● The pleasure of understanding what you're taught at school.
- ● The fear of not doing well at school.

Why does this particular belief or feeling motivate you?

22. How important are the four external pressures below to your study? Please rank them in order from most to least important.

	most important	2nd important	3rd important	least important
Pressure from your parents, caregivers or other adults in your life.	●	●	●	●
Pressure from peers.	●	●	●	●
Pressure from school to achieve good results.	●	●	●	●

	most important	2nd important	3rd important	least important
Pressure because of how your career or university goals are linked to study.	●	●	●	●

23. What do you see as being the primary outcome of study? (Select all that apply)

- ☐ Knowing more about a range of subjects.
- ☐ Being prepared to be a contributing member of society.
- ☐ Doing well on exams.
- ☐ Building skills to prepare for university entrance.
- ☐ Gaining a qualification.

24. How do you balance study with your social life?

- ● I study more than socialise
- ● I socialise more than study
- ● I have discovered how to balance my social life and study needs

Please say more about your answer.

25. Below are 6 factors you may consider in deciding what courses to take at school. Please rank them in order from the most to least influential in your decision making.

	Most influential	2nd	3rd	4th	5th	Least influential
Pressure or suggestions from parents	●	●	●	●	●	●
Pressure or suggestions from peers	●	●	●	●	●	●
Advice from teachers, school counsellor, school chaplain, or other school staff	●	●	●	●	●	●
A preference for particular teachers (so choosing courses that they teach)	●	●	●	●	●	●
A personal preference for particular subjects	●	●	●	●	●	●
Considering which courses will best prepare me for university	●	●	●	●	●	●

25. Below are 6 factors you may consider in deciding what courses to take at school. Please rank them in order from the most to least influential in your decision making.

	Most influential	2nd	3rd	4th	5th	Least influential
Pressure or suggestions from parents	●	●	●	●	●	●
Pressure or suggestions from peers	●	●	●	●	●	●
Advice from teachers, school counsellor, school chaplain, or other school staff	●	●	●	●	●	●
A preference for particular teachers (so choosing courses that they teach)	●	●	●	●	●	●
A personal preference for particular subjects	●	●	●	●	●	●
Considering which courses will best prepare me for university	●	●	●	●	●	●

26. Can you say more about your ranking to the question above? Which did you rank high/low and why?

Click "DONE" and you're finished!

Many thanks for completing this survey.

Appendix B: Survey for current teachers of Theory of Knowledge

"Understanding TOK: Purpose, Benefit and Expectations" (Teacher Survey)

Understanding Theory of Knowledge: Purpose, Benefit and Expectations

Dear International Baccalaureate Teacher,

We would like to invite you to participate in a research study being conducted by the University of Western Sydney in cooperation with the International Baccalaureate Organisation (IBO), entitled "Theory of Knowledge (TOK): Exploring learning outcomes, benefits, and perceptions."

The purpose of this survey is to investigate the subject of TOK in your school and how TOK enables critical thinking skills. Your responses will help us understand how TOK is working in your school and what you think about your own teaching of critical thinking skills. It will take about 20 minutes to complete this survey.

Your answers will only be seen by the researchers and will not be shown to anyone in your school, so please answer each question honestly. The research team will not report the names of teachers or schools that participate in the study. A report of the findings may be submitted for publication but individual participants and your school will not be identifiable.

Your participation is entirely voluntary and you may stop at any point.

This study is being sponsored by the International Baccalaureate Organisation, with in-kind support from the University of Sydney. This study has been approved by the University of Western Sydney Human Research Ethics Committee. The approval number is: H9892.

If you have any questions, you may contact Associate Professor David Cole on (02) 4736 0154. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee at UWS by email at: humanethics@uws.edu.au.

Thank you for taking the time to participate. Your participation is much appreciated!!

1. I have read and understood the above information and consent to participate in this project.
   Yes

   No

2. Today's Date DD MM YYYY
   ☐/ ☐/ ☐

3. Are you sure you would like to exit the survey?

- ● No
- ● Yes

Section One: About You

4. What is your gender?

- Male
- Female

5. What subject area(s) do you teach?

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Core	Interdisciplinary subjects
Language A1	Language A2	Social and cultural anthropology	Biology	Mathematics HL	Theatre	Extended essay	Literature and performance
Language A: literature	Language B	anthropology	Chemistry	Mathematics SL	Visual arts	Theory of knowledge	Environmental systems and societies
Language A: language and literature	Language ab initio	Philosophy	Physics	Mathematical studies SL	Music	Creativity, action, service	
	Classical languages	Geography	Design technology	Further mathematics SL	Film		
		Business and management	Sports, health and exercise science	Further mathematics HL	Dance		
		History		Computer science			
		Economics					
		ITGS					
		Psychology					
		World religions					

6. Which state/territory is your high school in?

- Australian Capital Territory
- New South Wales
- Victoria
- Queensland
- South Australia
- Western Australia
- Tasmania
- Northern Territory

7. Which high school do you attend in ACT?

- Narrabundah College
- Melba Copland Secondary College
- The Canberra College
- Canberra Girls Grammar School
- Other (Please specify)

8. Which high school do you attend in NSW?

- Australian International Academy - Sydney Campus
- Elonera Montessori School
- German International School Sydney
- Kambala
- Lycee Condorcet - The lnternational French School of Sydney
- MLC School
- Monte Sant' Angelo Mercy College
- Newington College
- Penrith Anglican College
- Queenwood School for Girls
- Ravenswood School for Girls
- SCECGS Redlands
- St. Andrew's Cathedral School
- St. Paul's Grammar School
- Trinity Grammar School-Sydney
- Other (Please specify)

9. Which school do you attend in NT?

- Kormilda College Limited
- Other (Please specify)

10. Which school do you attend in VIC?

- Australian International Academy of Education
- Geelong Grammar School
- Haileybury
- Ivanhoe Grammar School
- Kardinia International College
- Lauriston Girls' School
- Macedon Grammar School
- Methodist Ladies' College
- Presbyterian Ladies' College Melbourne

- Sophia Mundi Steiner School
- St. Leonard's College
- The Kilmore International School
- Tintern Schools
- Werribee Secondary College
- Wesley College, Melbourne
- Other (Please specify)

11. Which school do you attend in WA?

- The Montessori School
- Scotch College
- Presbyterian Ladies' College - Perth
- Treetops Montessori School
- International School of Western Australia
- Other (Please specify)

12. Which school do you attend in SA?

- Carey Baptist Grammar School
- Concordia College
- Glenunga International High School
- Mercedes College
- Pembroke School
- Prince Alfred College
- St Peter's Collegiate Girls School
- St. Peter's College
- Walford Anglican School for Girls
- Woodcroft College
- Other (Please specify)

13. Which school do you attend in TAS?

- The Friends' School
- Other (Please specify)

14. Which school do you attend in QLD?

- Cairns State High School
- Indooroopilly State High School
- John Paul College
- Mountain Creek State High School
- Queensland Academy - Science Mathematics and Technology
- Queensland Academy for Creative Industries
- Queensland Academy for Health Sciences
- Somerset College
- St. Peters Lutheran College
- Townsville Grammar School
- Trinity Lutheran College
- Other (Please specify)

15. How many years have you been teaching at any school (total lifetime years of teaching)?

- This is my first year
- Between 1-3 years
- Between 4-6 years
- Between 7-10 years

- More than 10 years

16. How many years have you been teaching at a school using the International Baccalaureate (IB) curriculum?

- This is my first year
- Between 1-3 years
- Between 4-6 years
- Between 7-10 years
- More than 10 years

17. Are you currently teaching (during the 2013 school year) the Theory of Knowledge (TOK) course?

- Yes
- No

18. Have you previously taught the Theory of Knowledge (TOK) course?

- Yes
- No

19. How many years have you been teaching/have you taught the TOK course?

- This is my first year
- Between 1-3 years
- Between 4-6 years
- Between 7-10 years
- More than 10 years

20. Is your school

- Single sex
- Co-Educational

Section Two: Your Teaching Practice

This section of the questionnaire is designed to help us gain a better understanding of the kinds of things that can create challenges for teachers with regards to teaching TOK.

Using the scale from [0-100] as a reference, please choose the percentage that best represents how confident you are that you can carry out the stated activity. For example, if you are completely confident that you can carry out an activity successfully, select 100 per cent. If you have no confidence that you can carry out the activity successfully, select 0 per cent. It's more likely that your confidence lies somewhere in between; please select the percentage that most closely matches your confidence.

21. I am confident that I can...

	(0) Not at all confident	**(10)**	**(20)**	**(30)**	**(40)**	**(50) Moderately confident**	**(60)**	**(70)**	**(80)**	**(90)**	**(100) Absolutely confident**
Teach conceptual and abstract thinking.											
Teach TOK students how to think through consequences.											
Help colleagues teaching TOK with their lesson design and approaches.											
Teach students to express their views freely during TOK lessons, while using supporting evidence.											
Help TOK students realise that systems are connected.											
Make my TOK classroom a safe space for freedom of expression.											
Keep students interested in the TOK curricular content.											
Help students to question assumptions in learning in the TOK classroom.											
Help students develop positive self-beliefs regarding their ability in TOK.											
Identify appropriate learning materials for the TOK lesson plans.											
Keep students on task during lessons with unfamiliar content in TOK.											

	(0) Not at all confident	**(10)**	**(20)**	**(30)**	**(40)**	**(50) Moderately confident**	**(60)**	**(70)**	**(80)**	**(90)**	**(100) Absolutely confident**
Get TOK students to think critically and question knowledge.											
Gauge student comprehension of what was taught in TOK.											
Help students enjoy coming to TOK class.											
Use various assessment strategies to meet the needs of diverse learners in TOK.											
Link the concepts taught in TOK to “real world” skills.											
Get the instructional materials and equipment I need to teach TOK.											

Section Three: How do you see your TOK students?

Imagine that students from your TOK class(es) are confronted with new knowledge – a new problem or question involving subject matter with which they are completely unfamiliar.

Using the scale from [1-7] as a reference, please select the number that best represents your opinion of the likelihood that students in your TOK classes will be able to complete each task or process presented in the list below. 1 represents “not very likely” and 7 represents “extremely likely”.

22. How likely is it that your students will…?

	(1) Not very likely	(2)	(3)	(4) Moderately likely	(5)	(6)	(7) Extremely likely
Work to clarify meaning and define terms with which they are unfamiliar?							
Work to understand the significance of the new material to see how it fits with their prior knowledge or experience?							
Express the new question in several ways to clarify its meaning and scope?							
Break the question into sub-questions?							
Seek to identify arguments being made?							
Work to analyse arguments being made?							
Seek to assess claims being made (rather than passively accepting those claims)?							
Imagine alternative ways to solve the same problem?							
Draw conclusions about their problem based on the evidence at hand?							
Restrict their claims to those supported by the evidence they have?							
Search for information that opposes their position as well as information that supports it?							
Consider how their							

assumptions are shaping their point of view?							
Be able to justify the strategies that they used to solve a problem or create an argument?							
Be able to present their argument to others in a way that they will understand?							

23. In my teaching of the TOK curriculum, I use: (Select all that apply)

- o Open ended questioning
- o Socratic method/Socratic dialogue [debate between two individuals with opposing opinions using logic testing to strengthen or eliminate hypotheses]
- o Extended written responses (essays)
- o Short answer responses
- o Multiple choice questions
- o Oral questioning methods such as interviews
- o Role play
- o Visual methods such as “mind mapping” or flow charts
- o Critique/deconstruction
- o Direct transmission of facts
- o Reading comprehension
- o Group work
- o Inquiry based learning
- o Mathematical thinking
- o Study of great philosophers
- o Analysis of philosophical concepts
- o Real life contexts and situations
- o Deduction/induction/logical reasoning
- o Intuition
- o Abduction
- o Imagination and/or Creativity
- o Something additional (Please tell us what else you are using in your TOK classroom)

24. What do you see as being the purpose of TOK? (Select all that apply)

- o To develop an awareness of how knowledge is constructed, critically examined, and renewed by individuals and communities;
- o To encourage students to reflect on their experiences in school and everyday life;
- o To help students make connections between academic disciplines and between thoughts, feelings and actions;
- o To help students develop an awareness of personal and ideological assumptions;
- o To prepare students for further learning;
- o Something else? (What else do you see as being the purpose of TOK? Why?)

25. Why did you select the choices for the question above? Please explain your response.

26. What is the most challenging aspect of TOK FOR STUDENTS in your experience? (Select all that apply)

- o Critically evaluating knowledge
- o Identifying and reflecting on personal assumptions
- o Identifying and reflecting on ideological assumptions
- o Identifying connections between the TOK content and content studied in other courses
- o Something else? (What else do you see as being the most challenging aspect of TOK? Why?)

27. Why did you select the choices for the question above? Please explain your response.

28. What is most enjoyable aspect of TOK FOR STUDENTS in your experience? (Select all that apply)

- Critically evaluating knowledge
- Identifying and reflecting on personal assumptions
- Identifying and reflecting on ideological assumptions
- Identifying connections between the TOK content and content studied in other courses
- Something else? (What else do you see as being the most enjoyable aspect of TOK for students? Why?)

29. Why did you select the choices for the question above? Please explain your response.

30. For you, what is the most challenging skill(s) to teach students in TOK ? (Select all that apply)

- How to critically evaluate knowledge
- How to identify and reflect on personal assumptions
- How to identify and reflect on ideological assumptions
- How to identify connections between the TOK content and content studied in other courses
- Something else? (What else do you see as being the most challenging skills to teach in TOK? Why?)

31. Why did you select the choices for the question above? Please explain your response.

32. For you, what is the most enjoyable about teaching TOK? (Select all that apply)

- Student reaction to TOK course content
- Personal discovery and understanding
- Reading associated texts in preparation for teaching
- Making TOK curriculum relevant to “real life” for students
- Something else? (What else do you see as being the most enjoyable about teaching TOK? Why?)

33. Why did you select the choices for the question above? Please explain your response.

34. Do you see TOK as having an impact on students’ later life, either at university or work? If so, how? If not, why not?

35. How does TOK relate to other areas of the curriculum?

36. Which philosophers do you cover in TOK and why?

37. What philosophical concepts do you cover in TOK and why?

38. What, in your opinion is your most effective method to teach TOK?

39. In your opinion, what critical thinking skills does TOK deliver?

40. In your experience, how can students improve their skills in TOK?

41. How have you improved your TOK teaching practice?

42. How do you create a positive learning atmosphere in TOK?

43. What support do you get from your school in terms of TOK delivery?

44. How well does your school value TOK teaching and learning?

45. What is the staff perception of TOK in your school?

46. What processes are in place at your school to share methods and ideas about TOK?

Click "DONE" to finish this survey.

Many thanks for your participation and help!

Appendix C: Survey for First-Year University Students

"University Life" Survey (Part A) and Sample Items from the CCTDI (Part B)

University of Western Sydney
Bringing knowledge to life

University life survey

Thank you for taking our University Life survey (parts A & B). Some information before you begin:

The purpose of this study is to understand how your thoughts about your critical thinking skills might be related to ideas about your general ability now that you are at university. All aspects of this study are confidential and anonymous. You may provide your email address to enter the prize draw but all contacts will be destroyed at the conclusion of the project. Findings from this project may be submitted for publication but no participants will be identifiable.

Your participation is entirely voluntary and you may withdrawal at any time without penalty.

This survey comes in two parts and will take between 15-20 minutes to complete both parts A & B.

This research is being paid for by the International Baccalaureate Organisation and is being conducted by a team of researchers from the School of Education at the University of Western Sydney, led by Associate Professor David Cole. If you require further information, you may contact A/P Cole at (02) 4736 0154.

This work has ethics approval (approval #H9892). If you have any complaints about the ethical conduct of this project, you may contact the Human Ethics Committee at humanethics@uws.edu.au.

To continue, you must TICK THE BOX below to provide consent to participate.

❑ I have read and understood the information above and provide consent to participate in this study.

Section One: Some Information About You And Your Schooling Experiences

1 Are you

❍ Male
❍ Female

2 What is your date of birth? （dd/mm/yyyy)

3 What year of university are you in?

- ❍ First Year
- ❍ Second Year
- ❍ Third Year
- ❍ Fourth Year
- ❍ Enrolled in an advanced degree (Masters, PhD, EdD)

4 Did you attend an International Baccalaureate (IB) high school?

- ❍ Yes
- ❍ No

5 Did you complete the Theory of Knowledge (TOK) curriculum in Year 11 and/or Year 12?

- ❍ Yes
- ❍ No

6 What was your mark on the TOK essay?

- ❍ Grade A, Excellent: 30-40 marks
- ❍ Grade B, Good: 23-29 marks
- ❍ Grade C, Satisfactory: 17-22 marks
- ❍ Grade D, Mediocre work: 11-16 marks
- ❍ Grade E, Poor: 0-10 marks
- ❍ I'm not sure/I don't remember

7 Which university do you attend?

- ❍ Australian National University (ANU)
- ❍ University of Sydney (USYD)
- ❍ University of New South Wales (UNSW)
- ❍ Other (Please specify) _____

8 What are you studying? _____

9 What was your ATAR (or IB equivalent ATAR, if applicable)? _____

10 In which country were you and your family born?

	Australia	Overseas
	Please Tick	Please specify which country
You	❍	_____
Your Mother	❍	_____
Your Father	❍	_____

11 Are you Aboriginal or Torres Strait Islander?

❍ Yes
❍ No

12 What is the highest degree your mum and dad have earned?

	High school diploma or equivalent	TAFE Certificate/Diploma	University degree (Bachelors or Masters)	Doctoral degree (PhD)	Professional degree (MD, DDS, EdD, JS, etc.)	I'm not sure.	None of these
Your Mum	❍	❍	❍	❍	❍	❍	❍
Your Dad	❍	❍	❍	❍	❍	❍	❍

Section Two: How You See Yourself as A Student

13 How confident do you feel about performing the following critical thinking tasks? Please select the response that best represents your level of confidence.

	Very confident	Confident	Not very confident	Not at all confident
Imaging alternate ways to solve the same problem.	❍	❍	❍	❍
Searching for information that opposes your opinion on a topic, as well as information that reinforces it.	❍	❍	❍	❍
Being able to justify the strategies that you used to solve a problem.	❍	❍	❍	❍
Working to clarify meaning when you encounter unfamiliar terms or concepts.	❍	❍	❍	❍
Working to analyse others' arguments.	❍	❍	❍	❍
Restricting your conclusions to only those supported by the evidence you have.	❍	❍	❍	❍
Considering how your assumptions are shaping your point of view.	❍	❍	❍	❍

14 Thinking about studying at university: To What extent are these statements true of you?

	Definitely False	False	Mostly False	More False than True	More True than False	Mostly True	True	Definitely True
I enjoy doing work for most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I like most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I have trouble with most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I am good at most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I hate studying for many academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I am not particularly interested in most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I learn quickly in most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I hate most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I get good marks in most academic subjects.	❍	❍	❍	❍	❍	❍	❍	❍
I could never achieve academic honours, even if I worked harder.	❍	❍	❍	❍	❍	❍	❍	❍

15 Thinking about your future at university: To what extent do you agree with the following statements?

	Strongly Agree	Agree	Disagree	Strongly Disagree
I will graduate from my university course.	❍	❍	❍	❍
I will finish my course without having failed a single unit.	❍	❍	❍	❍
During my study, I will need to repeat a unit a unit of study because I failed it.	❍	❍	❍	❍
I will not graduate on time.	❍	❍	❍	❍
I will not complete my undergraduate degree.	❍	❍	❍	❍
I will receive marks of "credit" or above during my university study.	❍	❍	❍	❍

Thank you very much for completing Part A of the survey!
****Part B continues on a separate webpage (instructions below)**

Part B: Sample Items from the California Critical Thinking Disposition Inventory (CCTDI)[14]

Subscales and Representative Item/Manual Description:

- Truth-seeking
  - "Many questions are just too frightening to ask." (reverse coded)
  - Truth-seeking is the habit of always desiring the best possible understanding of any given situation; it is following reasons and evidence wherever they may lead, even if they lead one to **question cherished beliefs**. Truth-seekers ask hard, sometimes even frightening questions; they do not ignore relevant details; **they strive not to let bias or preconception colour their search for knowledge and truth**. The opposite of truth-seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas.
- Open-mindedness
  - "Being open-minded about different world views is less important than people think." (reverse coded)
  - Open-mindedness is the tendency to allow others to voice views with which one may not agree. Open-minded people act with tolerance toward the opinions of others, knowing that often we all hold beliefs which make sense only from our own perspectives. Open-mindedness, as used here, is important for harmony in a pluralistic and complex society where **people approach issues from different religious, political, social, family, cultural, and personal backgrounds**. The opposite of openmindedness is closed-mindedness and intolerance for the ideas of others.
- Analyticity
  - "Getting a clear idea about the problem at hand is the first priority."
  - Analyticity is the tendency to be alert to what happens next. This is the habit of striving to **anticipate both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans**. The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically.
- Systematicity
  - "I'm known for approaching complex problems in an orderly way."
  - Systematicity is the tendency or habit of striving to **approach problems in a disciplined, orderly, and systematic way**. The habit of being disorganized is the opposite characteristic to systematicity. The person who is strong in systematicity may or may not actually know or use a given strategy or any particular pattern in problem solving, but they have the mental desire and tendency to approach questions and issues in such an organized way.
- Confidence in Critical Thinking
  - "I'm proud that I can think with great precision."
  - The tendency to **trust the use of reason and reflective thinking to solve problems** is reasoning self-confidence. This habit can apply to individuals or to groups; as can the

[14] The full CCTDI is not available or replicable here as it is a commercial instrument.

other dispositional characteristics measured by the CCTDI. We as a family, team, office, community, or society can have the habit of being trustful of reasoned judgment as the means of solving our problems and reaching our goals. The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason and reflection as a means to solving problems or discovering what to do or what to believe.

- Inquisitiveness
    - "Being inquisitive is one of my strong points."
    - Inquisitiveness is **intellectual curiosity**. It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being **curious and eager to acquire new knowledge** and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference.
- Maturity of Judgement
    - "Frankly, I am trying to be less judgemental."
    - Cognitive maturity is the **tendency to see problems as complex**, rather than black and white. It is the habit of making a judgment in a timely way, not prematurely, and not with undue delay. It is the tendency of standing firm in one's judgment when there is reason to do so, but changing one's mind when that is the appropriate thing to do. It is **prudence in making, suspending, or revising judgment**. It is being aware that **multiple solutions may be acceptable** while appreciating the need to reach closure in certain circumstances even in the absence of complete knowledge. The opposite, cognitive immaturity, is characterized by being imprudent, black-and-white thinking, failing to come to closure in a timely way, stubbornly refusing to change one's mind when reasons and evidence would indicate one is mistaken, or foolishly revising one's opinions willy-nilly without substantial reason for doing so.

Appendix D: Scales Used in the Quantitative Data Analysis

Scales used in University Students Survey[15]:

Item	Variable	Variable Label; Reliability Score for the current study
Self-Efficacy for Critical Thinking Scale [*SECT*] (Cronbach α = .75)		
1	eff1	Imaging alternate ways to solve the same problem.
2	eff2	Searching for information that opposes your opinion on a topic, as well as information that reinforces it.
3	eff3	Being able to justify the strategies that you used to solve a problem.
4	eff4	Working to clarify meaning when you encounter unfamiliar terms or concepts.
5	eff5	Working to analyse others' arguments.
6	eff6	Restricting your conclusions to only those supported by the evidence you have.
7	eff7	Considering how your assumptions are shaping your point of view.
Academic Self-Description Scale, General [*ASC*, from the SDQII; Marsh, 1992] (Cronbach α = .88)		
1	self1	I enjoy doing work for most academic subjects.
2	self2	I like most academic subjects.
3	self3	I have trouble with most academic subjects.
4	self4	I am good at most academic subjects.
5	self5	I hate studying for many academic subjects. (R)
6	self6	I am not particularly interested in most academic subjects. (R)
7	self7	I learn quickly in most academic subjects.
8	self8	I hate most academic subjects. (R)
9	self9	I get good marks in most academic subjects.
10	self10	I could never achieve academic honours, even if I worked harder. (R)
Anticipated University Outcomes Scale (Cronbach α = .78)		
1	Grad	I will graduate from my university course.
2	Nofail	I will finish my course without having failed a single unit.
3	Yesfail	During my study, I will need to repeat a unit a unit of study because I failed it. (R)
4	Gradlate	I will not graduate on time. (R)
5	Nograd	I will not complete my undergraduate degree. (R)
6	highmark	I will receive marks of "credit" or above during my university study.

[15] In addition to the commercial measure, the CCTDI.

Scales used in TOK Teacher Survey:

Item	Variable	Variable Label
Theory of Knowledge Teachers' Self-Efficacy Beliefs Scale [*TOK-TSE*] (Cronbach α = .96)		
1	TOKefficacy1	Teach conceptual and abstract thinking.
2	TOKefficacy2	Teach TOK students how to think through consequences.
3	TOKefficacy3	Help colleagues teaching TOK with their lesson design and approaches.
5	TOKefficacy5	Help TOK students realise that systems are connected.
7	TOKefficacy7	Keep students interested in the TOK curricular content.
8	TOKefficacy8	Help students to question assumptions in learning in the TOK classroom.
9	TOKefficacy9	Help students develop positive self-beliefs regarding their ability in TOK.
10	TOKefficacy10	Identify appropriate learning materials for the TOK lesson plans.
11	TOKefficacy11	Keep students on task during lessons with unfamiliar content in TOK.
12	TOKefficacy12	Get TOK students to think critically and question knowledge.
13	TOKefficacy13	Gauge student comprehension of what was taught in TOK.
14	TOKefficacy14	Help students enjoy coming to TOK class.
15	TOKefficacy15	Use various assessment strategies to meet the needs of diverse learners in TOK.
17	TOKefficacy17	Get the instructional materials and equipment I need to teach TOK.
	TOKefficacy6	*Make my TOK classroom a safe space for freedom of expression.*
	TOKefficacy4	*Teach students to express their views freely during TOK lessons, while using supporting evidence.*
	TOKefficacy16	*Link the concepts taught in TOK to "real world" skills.*
Critical Thinking Strategy Scale (*CTSS*) – Teacher Version (Cronbach α = .96)		
		How likely is it that you students will…
1	skill1	work to clarify meaning and define terms with which you are unfamiliar?
2	skill2	work to understand the significance of the new material to see how it fits with your prior knowledge or experience?
3	skill3	express the new question in several ways to clarify its meaning and scope?
4	skill4	break the question into sub-questions?
5	skill5	seek to identify arguments being made?
6	skill6	work to analyse arguments being made?
7	skill7	seek to assess claims being made (rather than passively accepting those claims)?
8	skill8	imagine alternative ways to solve the same problem?
9	skill9	draw conclusions about a problem based on the evidence at hand?
10	skill10	restrict your claims to those supported by the evidence you

		have?
11	skill11	search for information that opposes your position as well as information that supports it?
12	skill12	consider how your assumptions are shaping your point of view?
13	skill13	be able to justify the strategies that you used to solve a problem or create an argument?
14	skill14	be able to present your argument to others in a way that they will understand?

Note: Items in italics were removed from analysis because of their low loading to the factor.

Scales used in TOK Student Survey:

Item	Variable	Variable Label
Perceived Outcomes: "Lifeworld" Skills (Cronbach α = .84)		
1	lw1	The content of TOK has helped me solve everyday problems.
2	lw3	TOK is excellent preparation for living in the real world.
3	lw4	TOK has helped me strengthen my ability to think logically during everyday decision-making.
	lw2	*Taking TOK has not really helped to make me a more informed member of society. (R)*
Perceived Outcomes: Critical Thinking Skills (Cronbach α = .93)		
1	crit1	Taking TOK has taught me how to think critically before passively accepting new information.
2	crit2	Since taking TOK, I am better able to form my own ideas about new information.
3	crit3	Since taking TOK, I am more likely to recognise and question my assumptions about particular ideas or topics.
4	crit4	In TOK, I have learned how to approach a difficult question by looking at smaller, related questions.
5	self1	I think about things in a deeper way since taking TOK.
6	self2	Since taking TOK, I have become better at constructing logical arguments.
7	self4	I have gotten quite good at seeing multiple answers to complex problems since taking TOK.
8	self5	TOK has taught me how to theorise.
	self3	*I have not excelled at my work in TOK. (R)*
Critical Thinking Strategy Scale (*CTSS*) (Cronbach α = .94)		
		How likely is it that you will…
1	skill1	work to clarify meaning and define terms with which you are unfamiliar?
2	skill2	work to understand the significance of the new material to see how it fits with your prior knowledge or experience?
3	skill3	express the new question in several ways to clarify its meaning and scope?

4	skill4	break the question into sub-questions?
5	skill5	seek to identify arguments being made?
6	skill6	work to analyse arguments being made?
7	skill7	seek to assess claims being made (rather than passively accepting those claims)?
8	skill8	imagine alternative ways to solve the same problem?
9	skill9	draw conclusions about a problem based on the evidence at hand?
10	skill10	restrict your claims to those supported by the evidence you have?
11	skill11	search for information that opposes your position as well as information that supports it?
12	skill12	consider how your assumptions are shaping your point of view?
13	skill13	be able to justify the strategies that you used to solve a problem or create an argument?
14	skill14	be able to present your argument to others in a way that they will understand?
Motivated Strategies for Learning Questionnaire: Critical Thinking Subscale [Pintrich, Smith, Garcia & McKeachie, 1993] (Cronbach α = .87)		
1	ct1	I often find myself questioning things I hear or read to decide if I find them convincing.
2	ct2	When a theory, interpretation, or conclusion is presented in class or in readings for school, I try to decide if there is good supporting evidence.
3	ct3	I treat learning material as a starting point and try to develop my own ideas about it.
4	ct4	I try to play around with ideas of my own related to what I am learning at school.
5	ct5	Whenever I read or hear an assertion or conclusion in school, I think about possible alternatives.
Academic Resilience Scale [Martin & Marsh, 2006] (Cronbach α = .85)		
1	resil1	I believe I'm mentally tough when it comes to exams.
2	resil2	I think I'm good at dealing with schoolwork pressures.
3	resil3	I don't let a bad mark affect my confidence.
4	resil4	I don't let study stress get on top of me.
5	resil5	I'm good at bouncing back from a poor mark in my school work.

Note: Items in italics were removed from analysis because of their low loading to the factor.

Appendix E – An example of a transcript

Interviewer: What they were interested in particularly in Singapore was how TOK carries into Higher Education.

R: Absolutely.

I: So we…This part of…This is really setting up more of the context and better understanding for us about how you think about it…

R: Sure.

I: But there's another set of data about that…

R: Absolutely.

I: So do you want to just tell me a little bit R. about your story of coming to TOK here and what you are doing and what your role is?

R: Very happy to. My role at the school is Academic Director of Senior School, which means I'm responsible for the academic welfare of students across 10, 11 and 12, and I'm also the IB Diploma Coordinator. I do very little teaching; I have currently teaching one Year 12 Psychology class and one Year 12 Theory of Knowledge class. That's my entire teaching load. How did I come to TOK and IB? The International Baccalaureate was introduced here at Monte in… We had a new Principal arrive mid 2004; she held a meeting on IB Diploma…on IB in general because we are also a Middle Year school, and that's important because there's a continuum.

I: Yes.

R: She held a meeting for interested staff, and I didn't turn up…

I: Oh…

R: And she came to me and she asked me why, and I said because I thought it was a load of rubbish…I wanted no part of it, that we had a perfectly good Higher School Certificate and if it's not broken don't fix it, so she said, "Fine, you are now in the feasibility study because I need a devil's advocate".

I: Yes.

R: So effectively I became part of the committee to investigate the implementation of the IB Diploma here in school 4. I spent a lot of time in other schools researching it, and probably coming at it from quite a negative perspective, and I found Theory of Knowledge… I discovered Theory of Knowledge, and to me it was the glue that bound the whole thing together.

I: The IB?

R: The IB Theory of Knowledge…A subject was something that actually…for the first time I found a subject at a senior level which actually pulled together everything else, which makes kids step outside their comfort zone…exactly… into their little compartments where they move from an Economics to say a Chemistry class and never the twain shall meet. Suddenly there was some sort of cohesion across the programme, so I became enamoured with it and then I became…If anyone is going to run this programme it's going to be me, so hence I've got this dual role in the school. So…I…when we first started doing it, we only put Theory of Knowledge…Every school operates in departments in faculties… So it was decided that for ease originally that we would put it with Religion…We had a couple of people with degrees in Theology, Philosophy, etc. in the

Religion department and when I say degrees…post-graduate qualifications in those areas…I thought this could be a good fit…and also because we are a Catholic School, we also need to incorporate Religion somewhere into the overall programme. I then decided that…Well, I don't think it was a great marriage. It just…I don't know… They seemed to come at it from a particular angle. I didn't feel it had the depth and breadth across curriculum. It started to be seen as a Religion subject, and that was not what we wanted. So I decided to do something about it, and basically… I wasn't that thrilled with our results, and I could see things wrong with them, so I decided I needed to get involved in it myself and actually teach it myself, so now I'm in the second year of teaching it, so I taught Year 11 last year…I've got Year 12 this year. But I was also very heavily involved with the teachers prior to that.

I: So now has it moved away from the Religion department?

R: Yes, it has moved completely away from the Religion department. That doesn't mean that a Religion teacher won't teach it in the future; they may well, but yes it's moved away from the Religion department, however, with an appreciation that there is a very strong Ethics component, which can incorporate Religion, but particularly also from more than one angle.

I: Yes. It's interesting you did…you mention the Catholic school…the ethos of the school. Do you think that's important to the IB here…to TOK here?

R: To TOK… I think people assume… certainly when we go to workshops overseas…People assume because we are a Catholic school that we are probably teaching creationism and, you know, coming from this very narrow Catholic, Christian standpoint, and that is not in fact the way of thinking in this school at all IB or no IB. This is really…It's a progressive, innovative school, and yes we do teach Catholic religion, but we also teach the alternatives as well, and like N who you met before… N is an unashamed atheist, and that's absolutely fine. So, you know, a week ago in TOK we were questioning… we were looking at slavery and saying, well, you know, when is slavery OK. Like doing a relativist, universalist argument, you know, we can't always say that other cultures are wrong even though it's contrary to our beliefs and what we think, so the girls were required to come with ideas in class as to… you know, counter-claim…when can slavery actually be OK. Obviously, I don't want them to go home and say to their parents, " You should see what our teacher is teaching us", but it's basically they are thinking outside the square, they are thinking outside the box.

I: And probably trying to locate themselves in quite different contexts…

R: Oh, yes. And they are horrified that we would have the argument.

I: Yes…So these questions are bit more general, but anything else that arises, please.

R: Sure.

I: You've got a lot of knowledge. What was your area before the IB, your discipline?

R: My area is really weird. I never intended to actually be working. I was a stay-at-home mother, and I was a little bit bored so I thought I would do Dip Ed to amuse myself really…I was teaching at TAFE; I was very involved in adult teaching at TAFE, and I thought I'd do a Dip Ed, you never know, it could be useful. I did an Infants Primary Dip Ed because I knew I'd never ever want to work in a high school, but I had been a careers adviser, vocational education, so somebody needed a job-share careers advisor. I went into a state school as a job-share careers advisor for a number of years. It was good, be at home with the kids, go to work occasionally…taught at TAFE at night…it was OK. And then ultimately this school employed me to run debating, and then they started offering me other things…so I became a careers advisor here… I became Head of Year 12, and… I never actually wanted a career…my whole career has been quite accidental.

I: It's interesting that you are not locked into a subject…you are not in the "I am a Maths teacher".

R: No, and actually, that's actually quite important. I've got a degree in Economics and a degree in Psych obviously…Obviously Psych, but I've got no set thing in any subject. When we introduced the IB Diploma, I was excited by teaching Psych because that is what I had taught it in the TAFE system, and as you know, it's not a subject in the Higher School Certificate, so the opportunity to actually teach Psychology, and it's very real Psych…We are not playing around…We are not just dipping the toe in the water… We are getting right into it. It's pretty much a first or second year university Psych…The opportunity to teach Psychology is fantastic, wonderful. And I've subsequently become an IB marker, moderator, I've run workshops for them. I'm going to Jakarta in June to run a workshop for teachers there.

I: And you would do a lot of professional development here inside school 4, too?

R: We do, but we also do masses of professional development outside school 4, and much of that is off-shore. So I have done…since taking over this role, I have been overseas…And this is what makes it very unusual…I have been overseas many times within the Asia-Pacific region.

I: And you connect with other people then?

R: Oh, god, yes, absolutely. I mean the opportunity to spend time in a school in Cayenne? or Hong Kong or India or something… It's extraordinary. It's amazing, and I'm not the only one who's done it…a lot of other staff have done it…They come back with such great ideas, and a totally different perspective on the way education runs internationally, and I'm not only talking about TOK…

I: It's interesting… It's part of the context, isn't it? And what about the other schools in Sydney that deliver TOK?

R: We have a huge amount to do with them, so, I'm a coordinator obviously, and the coordinators meet once a term…

I: From all the IB schools?

R: From all the IB schools in NSW and ACT. In fact, we hosted the last meeting here which was about three or four weeks ago, but next term I have to go to Canberra for a meeting there, and then there will be two meetings in terms 3 and 4. We are friends…We know each other very well; I can pick up the phone and call any of them.

I: And do you share resources and approaches and so on?

R: Yeah, we also run network days in our schools on specific subjects, and also on Theory of Knowledge. I tend to run more Psychology, but I don't know if you've met B M? She's the Austral-Asian manager now. She was at MLC…

I: D might have met her…

R: He almost certainly has… She is fantastic. She is an Economics teacher, but importantly from your perspective, she is a very strong Theory of Knowledge teacher, but she's now the Austral Asian rep, so Australia, New Zealand, and she's dealing with universities…

I: Is she based in Singapore or here?

R: No, she's now based here. Did you know G V?

I: It rings a bell…

R: OK, she has replaced him.

I: OK. Let's go through these questions. What works best for you in TOK? These are really for a TOK teacher in particular rather than the coordinator.

R: OK.

I: What do you think works best in TOK?

R: Working best in TOK…I think…There is a guide, so we need to sort of think in terms of TOK language. We need to think in terms of the ways of knowing…the four ways of knowing; we sort of operate within that framework, and the areas of knowledge that support those ways of knowing. I think each class needs a great deal of preparation, however you go to a class and it pans out in a completely different direction, so probably the most important thing is flexibility…The flexibility to run in a direction because there is no sort of mandated content you have to cover. It's not like teaching a History course, and they are going to have to do a History exam. It's about getting them to think outside the square.

I: Great, so that flexibility for the teacher and for the students…

R: I think…not so much the flexibility for the students because what they have to produce at the end has to be quite tight, I mean, they have to be dealing with the knowledge issue, they have to use TOK terminology, and they have to understand the framework which we are on. But I think the teacher has to be flexible enough to let the kids also run with your ideas in a guided way.

I: OK. How do you think TOK can be improved?

R: How do I think TOK could be improved…I think from an IB perspective it could be improved by more explicit links being dictated to other subjects, however, having said that, there is an expectation from the IB that the other diploma subjects will incorporate it into their programming. We, at this school, explicitly now…I started doing it last year…the girls are required to keep on-line journals, and they are required to identify TOK experiences in their other subjects. So they go down to their Biology class, and they see something occurring there that they could see as a knowledge issue that could be developed, they need to record it and bring in examples. So we are trying to explicitly demonstrate to the girls the link between…

I: For example, what might one be?

R: Look the most obvious area is going to certainly be Psychology, and I guess it's because it's my own discipline, but for example coming out with…I don't know…Is behaviour a result of the environmental…or nurture. Is it nurture, is it nature? And obviously that sort of line is going to come up all the time, so some of those major arguments really link beautifully with Psychology. Is what we see really there? I mean getting into sensory perception in Psyche, can we rely on our memories? Getting into the cognitive side of Psychology, except it wouldn't be expressed like that, to what extent can we rely on our memory?

I: You would be using TOK language…

R: To what extent is our memory accurate…There is so much in Psychology, endless studies to support either side…

I: So one way it could be improved is that explicit connection…

R: Yes, but a good Theory of Knowledge should be able to do that, perhaps what is more difficult at a school level you've only got so many TOK teachers. Probably what's more important is that the other teachers are also engaging with TOK, and to some extent there will be some benefit in everyone being a TOK teacher, or everyone needs to see themselves as a TOK teacher.

I: Not quite there yet?

R: Not quite there yet, you know, some of them sometimes struggle to grapple with their own subject, and to sort of move outside their own comfort zone is really difficult. You can get an Economics teacher who wants to teach the theories and principles of Economics, and it's quite difficult to step outside that. It's probably a lot easier for Psychology teacher to see the links because it just links beautifully.

I: Yes. What does TOK mean for you? It's a very open-ended question.

R: What does TOK mean for me? I think for me personally, both as an educator and also personally, it's also made me think outside the square, and to see even what's going on in the media in different terms. I think differently because I've been teaching TOK now for 18 months. The girls use an expression here, and they say to me, "you are messing with our heads", and the first time they said it to me I said, "God, this is not good", but I've decided that it is good. We need to mess with their heads. Our kids are educated in a very linear, you know, you learn this and you do an exam, and you learn that, and you learn an exam. Really that's not what preparation for life or even tertiary studies is about. They have to actually move on and be able to think in a whole lot different directions, and to be able to recognise and value other perspectives.

I: Not even necessarily to take those on, but to recognise where they are coming from.

R: Exactly, like we spent quite a bit of time last year looking at different types of fallacies, so that the girls can actually see an argument and recognise the problem in an argument.

I: Yes, terrific. How does TOK relate to your other teaching or teaching in general?

R: I only teach TOK and Psyche and the links are enormous, and all the time in Psychology I "Hey, there's a TOK moment", in fact there was one this morning; I can't think what it was. I can't remember now, but it comes out of my mouth all the time, yeah.

I: And what about more generally critical thinking rather than specifically TOK? What does critical thinking mean to you?

R: Critical thinking, OK, so, well this is another issue across IB subjects, especially the Humanities type subjects and English. It's not just about knowing; it's also about being able to analyse, synthesise and develop the material as well. This has been a big deal in the new programmes – the re-writes of the subject guides that we are starting to see critical thinking actually being explicitly marked in the exams.

I: In the IB re-writes?

R: In the IB-driven re-writes yes, so for example in Psychology on an extended response was 22 marks; you'll have 9 marks for content, 4 marks for organization and 9 marks for critical thinking. So I said to the girls: "you can know everything there is to know; you can know the entire textbook by heart, and you might only get 13 out of 22 because unless you know how to take it to the next level, how to actually evaluate it, how to explicitly identify strengths and weaknesses in a balanced way, how to analyse, how to synthesise, how to apply the information, then it's useless". And really that's the way it should be. I'm sure that's the way it is in tertiary level as well.

I: Oh, I hope so. Do you think that critical thinking then can be taught?

R: Yes, I do. It needs to be modelled by the teacher throughout the course, so you come across an exam question, you know, there might be a dot point on a syllabus, evaluate this, and I'm talking about in another subject now, evaluate X…You are hammering into them, which of course means… and, you know, strengths and limitations, so that the kids are actually starting to think about evaluation is not just have a little write and

give your opinion, it's about analysing the strengths and limitations. We explicitly teach it in Psychology by using the words…like a kid would come up with a thing saying, "This study is not worthwhile because it lacks ecological validity" full stop. Not good enough, it lacks ecological validity because…or it lacks ecological validity in that… so that they can't just make a blank statement; they have to explain why.

I: Terrific, thank you. Can you unpack some of the elements of critical thinking, I mean, one is that because – going one step further to explain and justify. What are the other elements of critical thinking you think are important? For example, there's a few here: being purposeful in your thinking; concepts; inference; points of view; question producing; problem solving…

R: Well, all of those are almost implied. I mean in terms of critical thinking I expect the kids to…the very notion of doing a rote response is just anathema to anything we do, and it doesn't work. It is about being able to take a step back; being able to analyse in a balanced way and evaluate in a balanced way; and to actually use the information. Yes, it's about understanding the concepts, but that's the base level. It's about taking the concepts and developing those concepts and knowing what to do with them. We use some strategies – and again I'm referring back to Psychology since you've asked how I would…For example, in Psychology we use a couple of acronyms actually, but we tell the students if they are doing a long response, they need to consider MACEG, M being methodology, A being alternative perspectives, alternative theories, C being cultural considerations – really big deal in IB because these kids are being marked all around the world, so we have to teach them to write for an international audience - E for ethical considerations and also Gender. So the Psyche students on a 22-mark question they would actually write MACEG on the top of the exam paper to remind them, OK these are the things I need to consider, but then we get into something like on methodology the kids also have another little acronym which is SECRET G. They actually look at sampling Ethics, Credibility, Reliability and Validity, Reflexivity of the researcher, E being the expectations of the researcher but also of the participants, T triangulation, G generalisation into the wider population, so we are explicitly teaching them these skills. I have a feeling in all honesty that my students in Psyche…my better students in Psyche, if they study Psyche at university – and a lot of them do – that they will actually use those same… It's a great technique that they can use to take it further. As a university lecturer you might disagree, but… (She laughs).

I: No. I'm not so good at acronyms…

R: I'm not really big onto acronyms either, but just using those couple… they are quite key to what we do.

I: If you think about a student who is a critical thinker, that is outstanding, what sort of traits does that person have?

R: The traits of the critical thinker…They tend to be…outstanding communication skills, and they need to be taught to listen because generally they tend to be very assertive, perhaps even bordering on arrogant, so they need to be explicitly trained that they don't know everything and sometimes they need to sit and listen to the other side. They are very intelligent certainly. When you meet some of our students, some of them are just…they just blow you away with their ability…the way they think…they are amazing. They are certainly confident. They've got an ability to write, but that's part of communication. I think the actual notion of having a balanced perspective, and being able to consider other people's viewpoints for a bright girl in this school is something that needs to be taught. It doesn't come naturally to them. They get to the beginning of Year 11 and they think they know everything, and sometimes they find that they don't know everything and that they actually need to consider other viewpoints. There's a great little line in the IB mission statement which is hammered to my class all the time. We use it all the time and it is part of the mission statement and it says: "Others with their differences can also be right". And it's quite pivotal I think for Theory of Knowledge because actually learning and respecting that there are other points of view which can also be right…yeah…Sometimes capital punishment is right…Sometimes it is right to back a women to wear a veil…Sometimes…All the things that we would think were disgusting…

I: From our liberal, Western, modern…post-modern context.

R: Yeah.

I: What are the standards for critical thinking in terms of assessment; how can you assess critical thinking?

R: I would want to see in the grading in Theory of Knowledge, the grading actually occurs in the oral and also in the essay. I would expect to see that the student is not just putting forward claims. They are also putting forward counterclaims and creating some sort of balance in their argument. I would also expect, and this is expected in Theory of Knowledge, that the student demonstrates some sort of personal engagement with it… That it's not "this textbook says that and that textbook says that", that they can actually put in something that it's at a personal level as well even if that involves a personal example, but worked appropriately to…

I: And is that an element of the reflexive component?

R: Yes, except the reflexivity really comes into Psychology, but the concept works very nicely in Theory of Knowledge as well, that they actually need to be able to use a concrete example from their own personal experience either in their subjects or in their wider life or whatever, and be able to use that and actually demonstrate that as an example.

I: How do you think critical thinking is useful to you?

R: To me or to my students?

I: To you.

R: To me… I'm probably at the end of my career…What it has done to me; it has made me think differently. It has made me consider other perspectives, other viewpoints. I think I'm more open to learning. But can I answer it from the students?

I: Yes.

R: In terms of the students what I think it does is… It takes them beyond that model, that traditional 1950-style model that here's the textbook, learn it, come to the exam and regurgitate everything you know. We are beyond that. Let's face it, every bit of knowledge…there's a little laptop there. Every bit of knowledge could be accessed by anybody, anywhere. The knowledge is there. What we have to try and teach the kids to do in the 21st century is obviously how to use the knowledge, not just regurgitate the knowledge. I wish you could talk back to me! (She laughs).

I: I'm trying not to. And interrogate that knowledge in particular ways, too, in a range of as many ways as possible…

R: Exactly.

I: What skills are necessary for critical thought? We might have covered those enough.

R: I think a reasonably high intellect is necessary for high level of critical thinking, communication skills including listening. It's not just about getting up and sprouting your own stuff, it's also being able to take it back on board as well, again, being able to challenge assumptions and to think outside the square, being consciously aware that there is more than one perspective.

I: What about the…how is performance in critical thought evaluated through TOK? Could assessment processes be improved?

R: Yes, they could. Yes, it's really interesting. I think that sometimes the…I worry about the actual formal assessment in Theory of Knowledge. I see it doing great things for our students, but sometimes I feel that the formal assessment doesn't necessarily reflect the reality. For example, you can get a student who isn't great at putting her ideas on paper. Now I know there's an oral to take care of that, but I had a little girl here the other day, she is a bright girl, but she experienced a severe anxiety attack during her formal oral, and yet in class, in a more informal situation, she can contribute… she has the most amazing ideas and can actually look at things in a whole range of ways, and nowhere in her assessment is that ever going to come out, and I should feel for her.

I: And you can't because of this anxiety…you can't…

R: It's clinical anxiety. She's been treated for it.

I: She can't have an alternative mode of assessment… A second opportunity?

R: Well, there's more than one opportunity in a sense to do the oral, I mean we have practices, go back to her practices etc., but basically there's a set formal procedure we need to follow up.

I: And it's exam…?

R: No, Theory of Knowledge is not done as an exam, thank god it's not. I would hate to think ever in Theory of Knowledge that there's a formal curriculum saying: you must teach this, this, this and this, and then they turn up to an exam. And in our ignorance, the first year we were doing IB back in 2007, we actually had a Year 11 exam in Theory of Knowledge; we were learning, and I learnt pretty quickly that that is exactly contrary to the principles of Theory of Knowledge.

I: Whereas it's very familiar in HSC preparation…

R: Of course. Although you know the IB subjects are quite exam-based. So for example, in the Humanities subjects, high level students do 5 hours per subject, so Psychology…one two-hour exam, another two-hour exam, and then a one-hour exam. It's a lot.

I: So it doesn't remove kids from the HSC type of pressure.

R: Definitely not. It's definitely a pressure cooker. What the kids would refer to as IAs, the internal assessments. Then there are various other components. They have an extended essay, which is a very extensive university level essay in a subject of their choice.

I: But they write that one over time…

R: They write that one over time, and they have a supervisor to mentor them, but yeah, there's a lot of pressure on the kids.

I: How is involvement of critical thinking induced in the classroom? I think you've already said that through the teacher modelling…

R: Through the teacher, no, but also the teacher has to step back occasionally. There's no point in a teacher standing and just "blah, blah, blah" for the 55 minutes. Rather, and I do, you could see I blah, blah, that's what I do. However, what I often like to do is actually find some sort of stimulus material, and it might be a cartoon, it might be a piece of writing, it might be a two-minute snip of film, something that actually allows them to engage, and the classroom discussion is actually very thick; they are not in any way reticent in taking part

I: How many students do you have in the Year 12 class?

R: In Year 12 overall we have 49 students doing IB this year, but we have 3 TOK class, pretty much evenly divided across the three. What we do is we timetable them at the same time deliberately. We have the three rooms close to each other, and we do a lot of splitting between classes, so we work with each other's strengths…

I: So you mix them up.

R: We mix them up. We mix them up a little bit, although we each have our own class, but sometimes we bring them together and we get them engaged. So for example on Monday this week with Year 12, one of the other teachers was away…We needed to somehow work the classes together, and we did an academic controversy, so we presented them with a knowledge issue, a continuum, ask them to place themselves somewhere on that continuum, we then put them into one end of the continuum versus the other, and they didn't get a choice into where they sat… Do you know how academic controversy works? They spent two minutes working at…no, sorry five minutes working at… let's say you and I were working on the affirmative, we would spend five minutes working at the affirmative case, then we would be put with a pair who were working at the negative case, so it went, affirmatives they could speak for two minutes, they could rebut for one minute, then they could present their case for two minutes, then we would rebut for one minute. So in the space of about half an hour we had a very nice little effective arrangement where everybody in the class has had to think, everybody has had to be involved, and then we would have feedback to the class about it, where you sat on the continuum, why was it difficult to be in the group you are in, how did you find it difficult to add something different, do you know what I mean.

I: Did they then shift? Did you try where they were on the continuum again and see if they shifted locations…

R: No, we didn't do that. We ran out of time, right. It was just a nice little activity to make them all think. It was good.

I: And it was like… debate-like but not performance…

R: Absolutely. Another nice little technique is to have a debate, get them to prepare it for a short time, and then start the debate but give the other's aside…

I: Than the one they prepared?

R: Yes, reverse debate. Obviously there are heaps of strategies. It just happens to be what's on my mind this week.

I: Do you understand how philosophy relates to TOK more broadly? N's had a few ideas about that. I think that's his background…

R: Yeah, I mean most definitely I mean Reductionism versus Holism?, Nature Nurture, some of those sort of classic arguments, but then getting into for example ethical standpoints and looking at those as well, but we are at great pains to emphasise to the students that it's not a philosophy course as such; it's about thinking differently, yes, sometimes philosophy will come into it, I mean it is an epistemological exercise always, but it's not philosophy. Yes, we spend some time on logic, but really we are at pains to ensure that it's not philosophy, that it's across many disciplines.

I: And when you said you had a parent-information night a few weeks ago, how did you explain it to the parents? How did you introduce it to those Year 11 parents, weren't they?

R: Some of the others must have said it; I don't think I said I had a parent-information…

I: You told me on the phone.

R: Ah, OK, Yes. I think it's a bit of a mystery for them. In fact I have considered that it would be nice to have a TOK day or morning with the parents…It's just a time issue for everybody, but the parents figure it out really quickly because I sort of say to them, "OK, it's a course designed to make you think outside the square". I mean I often use an example with the parents; I choose the tree that's out on there on the circular drive. You say to the kids "the tree is there when you look at it, but when you move away from it, how do you know the tree is still there?" A little bit like the tree falling in the forest; it doesn't actually fall or it doesn't make a noise if no one actually hears it, so I might use an example like that, but the parents sort of…Because the kids overwhelmingly are going home, and they are taking some of the concepts from class. "Guess what we did". They are applying them or actually talking about it because sometimes the parents will think I'm pro this or pro that when of course it's not the case. It's all about having a measured, balanced approach…not necessarily measured…diverse opinions, yes.

I: Do you have any other thoughts about…I'm very interested it's a girls' school; it's the only girls' school that we will talk to…Does that have any impact or effect in the way you think about it, or the way that it runs here or what the girls learn through TOK that could be different…?

R: I think it does. We are a very feminist school. The girls' attitude here is…like they are not here to get the white picket fence and 2 babies by forty-five; that's…I can get all forty-nine of them and ask them was that high on their list of priorities and it wouldn't be. Some of them might like to be mothers somewhere down the track, but these girls are going to be career women. They are going to university; they are going to have a career in their own right, and so how does that impact…I think on many of the…They tend to come at things from a very feminist perspectives. Last year we asked them to do a little exercise on…We asked them to extract a knowledge issue from something that was going on in the media in small groups, and multiple groups came up with… You know the girl who was shot, was it Mali?…you know what I'm talking about. Many of the students actually chose that; they didn't come at just the girl issue, but you know, to what extent can culture dictate this, etc. All of them put the education forward yes, but I noticed that they tend to hone in on the more feminist topics that are out there, but it's just something they do.

I: Have they talked about Julia Gillard?

R: Well, actually, I had a Psyche class this morning, but, no they haven't, no. I know when she became Prime Minister there was palpable excitement among some of the students. I think because they sort of thought, OK that's another thing in this country that's actually achievable, but…

I: What was interesting…I was curious about the response when she was elected to be Prime Minister, you know, after the election, not at the previous moment, and I couldn't find very much at all from about what girls thought, and those reports I did find in newspapers, and this is 2010 when they rushed out and said, "What do you think girls?", and the girls that I did find interviewed in newspapers said "It's all very well, but I always knew this was possible, why are you even making a fuss now, I already knew that girls could do anything, so there's a new woman Prime Minister, that's nice but"…The excitement that I had too that something seemed possible that hadn't before was sort of dissipated with young girls/women. Anyway, it has nothing to do with this project, but the post-feminist moment where girls really do believe that is feminism still even relevant at the moment…Anyway, research that I have other than this project…

R: But coming back to your question I think that not having males here probably improves their willingness to actually express an opinion. I don't know if this is true – well I know there's some research to support it as well – but my overwhelming sense is that girls do better in a single-sex school and boys do better in a co-ed school.

I: I think that's the probable drift of research. I haven't researched in that area in particular. In terms of the girls and their trajectories into university just to finish up, do you have any sense that what they've learnt here does translate or does have an impact to know their pathways?

R: Yes, so much more from IB than from HSC.

I: Really?

R: Absolutely. That's not just like… The girls seem…our IB students with equivalent ATARs appear to do better at university than the equivalent HSC student. For a start they tend to do better to start with, so the ATAR conversion is very favourable for the IB students.

I: Is that just a statistical quirk?

R: It's a statistical quirk. However, having said that, I also think that the level of thinking that is required in IB is much more than the HSC. HSC requires critical thinking too, there's no shadow of a doubt, but there's a level of regurgitation that's involved, whereas if you just regurgitate in IB, you are going to struggle, and I think it's also part of the reason why if you look…relatively speaking Australian schools do better in the IB diploma than in most other parts of the world…I don't know if you've seen the data. In fact, I've got a lovely little table there somewhere, so I'll show our average score versus Australia's average score, and ours is much higher than the Australian average score, which in turn is much higher than the world average score….I don't know where I was going, what was I going to say? I don't know where I was heading, but I'll head in a different direction now. Our students actually…for example American students…they tend to do far better when they hit universities overseas, particularly on exchange programmes because they seem to be able to think…I know where I was headed…In some of the workshops I've been in, including on Theory of Knowledge, like teachers for example from mainland China or Hong Kong…They will sit there and they get quite frustrated with the workshop, and they say, "but the workshop is not modelling the answer". They want a model answer. What can I take home and give to my students, and say "this is how you do it", and that's the whole point. It's not how you do it. It's you've got to figure out how to do it. You've got to be able to think and do it for yourself. It's not just about the knowledge, and that is a massive cultural divide between Australia and some other…our more individualistic approach.

I: And those teachers from that particular context then… would they be approaching Theory of Knowledge as if it is Science or some other discipline and it just doesn't work that way?

R: Yes, so some schools I've come across, not necessarily here in Australia but elsewhere… they will have teachers, "OK, you are going to do the stuff that pertains to History and you are going to do the bit that pertains to Maths in TOK", and that's fine provided they are all on board with the notion of what Theory of Knowledge actually is.

I: Cut across those disciplines…

R: Cut across them, but also what's the knowledge issue here? What claims can we make to support that knowledge issue? What counterclaims can they come up with? They need to come at it from that perspective. It's not just go and do a little lecture on Maths. Do you know what I mean? I think that's where…I think that could be a problem...what would strengthen that model if the teachers are on board and understand Theory of Knowledge, then there's a problem with it. And there's no prescribed way of teaching Theory of Knowledge. I like what we are doing at the moment. I think having two or three teachers actually running the show but trying to draw on the expertise of the others – very collaboratively – There's one other thing I'd like to mention if you don't mind. Michelle Stocks is our other teacher…She is currently at a conference in Taiwan? I actually should be there as well, but for a reason I decided not to go. One of the things we have here…We have the Middle Years Programme of IB, so for the first four years all of our students are IB students, so it's a…The IB Middle Years Programme is a framework and we actually place that above…almost as an umbrella over the Board of Studies content that is mandated, so we are managing very nicely to deliver both programmes.

I: And then they diverge…

R: And then at the end of Year 10 they have to choose between High School Certificate or the Diploma, and I think one of the strengths we are finding now in Years 11 and 12 in both programmes is the Middle Years Programme coming through, so the students are taught for example, explicitly taught, 7 to 10 for example to be reflective. When they get an assessment back, they are marked against very explicit criteria, mandated criteria by IB but also while meeting the Board of Studies requirements, but part of that is an element of reflection and being able to think…being able to do that. Also in Year 10 as part of MYP they have to do a personal project, so they have to do a project that is their own…something that they take and develop themselves. It is wonderful, wonderful training for what they have to do then in Year 11 and 12.

I: And it's very broad, isn't it. I think I met somebody who was learning Norwegian.

R: Oh, anything. It could be great cooking; it could be go and run a programme for disabled kids at sunshine homes. One of my students did it on anime and Japanese culture…like it could be absolutely anything, something they are passionate about. One of our girls last year did training of a greyhound. She took a greyhound that was going to be put down, a little skinny greyhound that was going to be put down, and she took it and she trained it into this most beautiful dog. In fact it came to our exhibition last year, this beautiful, perfectly behaved dog that was just the most loved family pet, and it had gone from being abused, etc. and she had managed to…I mean she had to write a whole report. It wasn't just fixing a dog; there was a whole research report that went with it on how to do that… really impressive stuff.

I: So they are already in if they are going to the HSC strand…

R: They've done that.

I: They've done quite a lot of independent thinking, and they've learnt a lot about how to think.

R: That's right. So it's a lovely framework for what we do in Years 11 and 12 regardless of which programme we teach.

I: How do they choose the HSC and IB?

R: I'm running a twilight workshop here in May where I sort of roll out… We do it on IB because IB is a little less known. Everybody knows what the HSC is, but IB Diploma, you know, it's a bit of mythology about it so I run a workshop for Year 10 girls and their parents in May, and the girls can choose whether or not they want to do it, so they can choose whether or not they even want to come. Then towards the end of next term we run a subject selection evening rolling out both programmes equally. We also then go through a subject market. We interview every student. We do podcasts for every subject, so the girls can sit down, you know, I'm tossing up between HSC and IB, so there will be a Society and Culture podcast, an English podcast, a Maths podcast, and these are snippets where the teachers have put them together…

I: You teach English Extension 2 here.

R: Oh yeah.

I: Is there anything that those sorts of kids who love to do the creative project; is there anything in the IB that would enable them to do that sort of thing?

R: A kid who wants to do English Extension Two; she's that sort of kid…She would almost certainly then choose… she would choose IB… She would choose to do higher level English; you know that you have to do standard or higher level of any subject. She would typically choose Higher Level English, and she would probably do her extended essay in some area of passion within English. A big carrot for the IB here is Psychology; it's a bit of a girl thing I think. A lot of our girls choose to do Psychology at tertiary level, in fact and

extraordinary number. They seem to be set on fire by a couple of things that we do in Psyche. They are absolutely wrapt in the notion of neuroplasticity, and it is cutting edge…the things yet to be discovered…

I: And you are teaching that?

R: Yeah, and there's stuff to be discovered there and they get excited about it, so they would go and enrol in a Science degree that enables them to do some Neuroscience and Psychology so they are together…

I: Fantastic, at Sydney Uni.?

R: Oh, well, wherever, obviously subjects come in different names and everything in different universities, but yeah they look for a degree that will enable them to do that. So there's quite a very strong… And the girls come back; like the girls that are at Sydney… they actually come back laughing because they say that their internal assessment for IB in Psyche is much harder than their experimental assessment in first year at Sydney University. They tell me that it doesn't include inferential stance at Sydney Uni. Because it's too hard for them, whereas we have done inferential stance here, so you know.

I: Fantastic.

R: I told you right at the beginning that I was someone who was violently opposed to the introduction of IB. I have a feeling that I've probably crossed to the dark side, but yeah… (She laughs).

I: You could be on the poster…An advocate.

R: Yes.

I: That's great. Well, let's finish off now.

Appendix F: Exploratory Factor Analysis (EFA) Results, "*Lifeworld Skills*"/"*Critical Thinking Outcomes*" Measures

"Lifeworld" Skills (4 items)

			Component 1
1	lw1	The content of TOK has helped me solve everyday problems.	.86
2	*lw2*	*Taking TOK has not really helped to make me a more informed member of society. (R)*	*.51*
3	lw3	TOK is excellent preparation for living in the real world.	.85
4	lw4	TOK has helped me strengthen my ability to think logically during everyday decision-making.	.85
Eigenvalue			2.44
% of variance			61.04
Alpha			.77

Note: *N* = 1335

"Lifeworld" Skills (reduced to 3 items)

			Component 1
1	lw1	The content of TOK has helped me solve everyday problems.	.87
2	lw3	TOK is excellent preparation for living in the real world.	.87
3	lw4	TOK has helped me strengthen my ability to think logically during everyday decision-making.	.87
Eigenvalue			2.27
% of variance			75.74
Alpha			.84

Note: *N* = 1335

"Critical Thinking Outcomes" (9 items)

			Component 1
1	crit1	Taking TOK has taught me how to think critically before passively accepting new information.	.83
2	crit2	Since taking TOK, I am better able to form my own ideas about new information.	.84
3	crit3	Since taking TOK, I am more likely to recognise and question my assumptions about particular ideas or topics.	.86
4	crit4	In TOK, I have learned how to approach a difficult question by looking at smaller, related questions.	.72
5	self1	I think about things in a deeper way since taking TOK.	.84
6	self2	Since taking TOK, I have become better at constructing logical arguments.	.82
7	*self3*	*I have not excelled at my work in TOK. (R)*	*.26*
8	self4	I have gotten quite good at seeing multiple answers to complex problems since taking TOK.	.80
9	self5	TOK has taught me how to theorise.	.79
Eigenvalue			5.34
% of variance			59.30
Alpha			.91

Note: *N* = 1335

"Critical Thinking Outcomes" (reduced to 8 items)

			Component 1
1	crit1	Taking TOK has taught me how to think critically before passively accepting new information.	.84
2	crit2	Since taking TOK, I am better able to form my own ideas about new information.	.84
3	crit3	Since taking TOK, I am more likely to recognise and question my assumptions about particular ideas or topics.	.86
4	crit4	In TOK, I have learned how to approach a difficult question by looking at smaller, related questions.	.72
5	self1	I think about things in a deeper way since taking TOK.	.84
6	self2	Since taking TOK, I have become better at constructing logical arguments.	.82
7	self4	I have gotten quite good at seeing multiple answers to complex problems since taking TOK.	.80
8	self5	TOK has taught me how to theorise.	.79
Eigenvalue			5.28
% of variance			66.01
Alpha			.93

Note: *N* = 1335

Appendix G: Exploratory Factor Analysis (EFA) Results, "Theory of Knowledge Teachers' Self-Efficacy Beliefs Scale" [*TOK-TSE*]

Original EFA Solution (17-items):

			Component	
			1	**2**
1	TOKefficacy1	Teach conceptual and abstract thinking.	**.745**	.048
2	TOKefficacy2	Teach TOK students how to think through consequences.	**.784**	.074
3	TOKefficacy3	Help colleagues teaching TOK with their lesson design and approaches.	**.804**	-.039
4	TOKefficacy5	Help TOK students realise that systems are connected.	**.463**	.431
5	TOKefficacy7	Keep students interested in the TOK curricular content.	**.572**	.366
6	TOKefficacy8	Help students to question assumptions in learning in the TOK classroom.	**.449**	.503
7	TOKefficacy9	Help students develop positive self-beliefs regarding their ability in TOK.	**.691**	.223
8	TOKefficacy10	Identify appropriate learning materials for the TOK lesson plans.	**.989**	-.132
9	TOKefficacy11	Keep students on task during lessons with unfamiliar content in TOK.	**.695**	.196
10	TOKefficacy12	Get TOK students to think critically and question knowledge.	**.658**	.249
11	TOKefficacy13	Gauge student comprehension of what was taught in TOK.	**.962**	-.159
12	TOKefficacy14	Help students enjoy coming to TOK class.	**.793**	.145
13	TOKefficacy15	Use various assessment strategies to meet the needs of diverse learners in TOK.	**.853**	-.032
14	TOKefficacy17	Get the instructional materials and equipment I need to teach TOK.	**.857**	-.051
	TOKefficacy4	*Teach students to express their views freely during TOK lessons, while using supporting evidence.*	.230	**.705**
	TOKefficacy6	*Make my TOK classroom a safe space for freedom of expression.*	-.119	**.976**
	TOKefficacy16	*Link the concepts taught in TOK to "real world" skills.*	.198	**.613**
Eigenvalue			10.99	1.07
% of variance			64.62	6.31
Alpha			.96	.82

Note: *N* = 83; Italic items have been removed from the analysis for final report.

Revised, 14-Item Solution EFA:

			Component 1
1	TOKefficacy 1	Teach conceptual and abstract thinking.	.77
2	TOKefficacy 2	Teach TOK students how to think through consequences.	.83
3	TOKefficacy 3	Help colleagues teaching TOK with their lesson design and approaches.	.75
4	TOKefficacy 5	Help TOK students realise that systems are connected.	.78
5	TOKefficacy 7	Keep students interested in the TOK curricular content.	.84
6	TOKefficacy 8	Help students to question assumptions in learning in the TOK classroom.	.83
7	TOKefficacy 9	Help students develop positive self-beliefs regarding their ability in TOK.	.86
8	TOKefficacy 10	Identify appropriate learning materials for the TOK lesson plans.	.88
9	TOKefficacy 11	Keep students on task during lessons with unfamiliar content in TOK.	.84
10	TOKefficacy 12	Get TOK students to think critically and question knowledge.	.84
11	TOKefficacy 13	Gauge student comprehension of what was taught in TOK.	.84
12	TOKefficacy 14	Help students enjoy coming to TOK class.	.90
13	TOKefficacy 15	Use various assessment strategies to meet the needs of diverse learners in TOK.	.82
14	TOKefficacy 17	Get the instructional materials and equipment I need to teach TOK.	.81
Eigenvalues			9.59
% of variance			68.51
Alpha			.96

Note: $N = 83$

Appendix H: Exploratory Factor Analysis (EFA) Results, "*SECT*" Measure

Self-Efficacy for Critical Thinking (*SECT*) (Cronbach α = .75)

		"How confident do you feel about performing the following critical thinking tasks…?"	**Component 1**
1	eff1	Imaging alternate ways to solve the same problem.	.57
2	eff2	Searching for information that opposes your opinion on a topic, as well as information that reinforces it.	.61
3	eff3	Being able to justify the strategies that you used to solve a problem.	.67
4	eff4	Working to clarify meaning when you encounter unfamiliar terms or concepts.	.66
5	eff5	Working to analyse others' arguments.	.71
6	eff6	Restricting your conclusions to only those supported by the evidence you have.	.55
7	eff7	Considering how your assumptions are shaping your point of view.	.64

Note: N = 389.

Appendix I: Exploratory Factor Analysis (EFA) Results, "University Outcomes" measure

University Outcomes (6-item Cronbach α = .78)

			Component	
			1	**2**
1	grad	I will graduate from my university course.	.24	**.81**
2	nofail	I will finish my course without having failed a single unit.	**.89**	.12
3	yesfail	During my study, I will need to repeat a unit a unit of study because I failed it. (R)	**.90**	.12
4	graduate	I will not graduate on time. (R)	**.69**	.32
5	nograd	I will not complete my undergraduate degree. (R)	.14	**.88**
6	highmark	I will receive marks of "credit" or above during my university study.	**.43**	.27
Eigenvalues			2.91	1.05
% of variance			48.43	17.49
Alpha			.77	.68

Note: N = 382.

University Outcomes (Suppressed to one factor; Cronbach α = .78)

			Component
			1
1	grad	I will graduate from my university course.	.65
2	nofail	I will finish my course without having failed a single unit.	.81
3	yesfail	During my study, I will need to repeat a unit a unit of study because I failed it. (R)	.81
4	gradlate	I will not graduate on time. (R)	.75
5	nograd	I will not complete my undergraduate degree. (R)	.61
6	highmark	I will receive marks of "credit" or above during my university study.	.51

Note: N = 382.

Appendix J: The coded qualitative results for RQ#1

Code	Description	School	Data source
Engagement	The learning of CT skills depends on engagement with TOK	1, 4	Ad, T, Fg
Thought experiments	Teachers have to devise thought experiments to engage the children in TOK	1	T
TOK moments	TOK moments define good TOK teaching and learning	1,2	T
Whole school	CT skills come about due to a whole school approach	1, 3	T, Ad, Da
Discussion work	CT skills can be a matter of good discussion work	1, 4	T, Lo, Fg
Questioning attitude	CT skills are developed through a questioning attitude	1, 4	T, Lo, Fg
English language skills	CT skills development can be inhibited for ESL students who lack English vocabulary	1	T, Lo
Holistic/ethical thinking	CT skills are developed as part of the push to make the world a better place	1, 4	T
Data analysis	Data analysis helps to develop CT skills	1, 4	Ad, T
Explicit teaching	CT skills have to be explicitly taught	1, 3	T
Philosophical vagueness	Teenagers can react against the philosophical vagueness of TOK and not learn CT skills	1	T
CT 'hole'	Students do not know that they are developing CT skills or higher order thinking at first	1, 4	T, Lg
Knowledge questions	Good TOK work involves the purposeful questioning of knowledge	1	T
Evidence	Students need to become skilled at using evidence in their arguments	1	T
Knowledge perspectives	CT involves the evaluation of knowledge perspectives	1,2	Ad, T
Independent learners	CT involves becoming an independent learner	1,2, 4	T, Da
Student readiness	Students have to be ready for TOK level work to develop CT	1	T
Logical arguments	TOK has helped me to develop the correct use of logical arguments	1, 3, 4	T, Fg
Linguistic power	TOK has given me more linguistic power to think	1	Fg
World awareness	TOK has helped to produce a greater world awareness in order to solve and understanding problems	1, 4	Fg, T
TOK outcomes	The TOK outcomes do not assess all the CT that happens in the TOK classroom	2	T, Ad
TOK limits	CT has to be limited and focused to good knowledge problems	2	Ad
Essay writing	Some students who are good at CT do not excel at essays	2	T
IB DP stress	The IB DP can be very stressful which makes CT difficult	1, 2	Fg
Teacher knowledge	Some teachers do not know how to teach CT	2	Fg
Truth seeking	TOK develops the ability to seek the truth	3	T, Fg
Socratic dialogue	Teachers use Socratic dialogue to encourage working towards the truth	3	T, Lo
Open-mindedness	The development of CT is a matter of open-mindedness	3, 4	T, Lo, Lg
TOK journals	CT skills are developed by TOK journal writing	3	T, Lo, Da, Fg
Conceptual power	Students develop conceptually as they challenged to think about knowledge problems	3	T
TOK precision	Some students experience a lack of precision in their thinking as they develop broad conceptual powers in	3	T, Fg

	TOK		
Critical literacy	CT skills are developed alongside critical literacy skills	4	T, Lg, Da
Balance	CT skills are a type of balance	4	T, Ad
Curiosity	TOK should arouse intellectual curiosity in CT	4	T
Confidence	Good CT requires confidence to go beyond the teacher's direction	4	T, Lo
Organic	CT involves a matter of organic infusion of abstract skills	4	Fg
Analytic skills	TOK enhances the power to analyse material critically	4, 3	T, Fg

Key: T-Teacher, Ad- Administration, Fg - Focus groups, Da- Document analysis, Lo –Lesson observation

The coded results for RQ#1 were collapsed into the following qualitative themes by the research team:

1) *Student learning*
2) *Teacher CT design*
3) *TOK specifics*

Appendix K: the coded qualitative results for RQ#3

Code	Description	School	Data Source
Profile raising	The profile of TOK has been raised through workshops and devotional speeches	1	T, Ad
Knowledge scenarios	Good students realise that there are different scenarios for knowledge building	1, 3	T
TOK workshops	We have regular TOK workshops for staff	1	Ad
TOK links	We work through the TOK links in the textbook	1, 3	T, Lo
TOK & art	TOK helps with conceptual work in art	1	T
TOK & English	TOK helps with the theoretical aspects of English	1, 4	T, Lo
TOK & language	TOK study aids with respect to understanding other cultures & languages	1	T, Da
IB DP teachers	IB DP teachers must know how to integrate TOK into their lessons	1, 3, 4	T
TOK challenge	TOK is a very challenging subject for students at the beginning of the IB DP course	1, 2, 3	T, Ad, Lo, Fg
TOK & History	TOK ideas are very suited to the study of history because we question evidence	1, 2	T, Fg
Slow awakening	TOK is a type of slow awakening	1	T
TOK & Maths	TOK can help with abstract thought in Maths	1	T
EE	TOK has helped to evaluate knowledge in the extended essay	1, 2, 4	Fg, T
Data analysis	TOK has provided the thinking skills to analyse data more carefully	1, 4	Fg, Da
Double-edged sword	TOK makes me ask broad questions, but I have to stop myself and realise that I am doing a qualification with 'tick-box' elements	1	Fg
Recognition of perspectives	TOK has helped me with the recognise different perspective in my theatre studies	1	Fg
TOK moments	TOK moments should happen across the curriculum in the IB DP	2, 3, 4	T, Ad, Da
Grey areas	In TOK we work on the grey areas of knowledge	2	T, Fg
Inter-disciplinary	TOK is fundamentally inter-disciplinary by nature	2, 4	Ad
Conceptual thinking	The strength of TOK is that it gets student to think conceptually	2, 4	T
TOK assessment	TOK assessments are not directly relevant across the IB DP suite of subjects	2	Ad
TOK beliefs	TOK can encourage a set of beliefs that state that all knowledge can be questioned	2, 3	T, Ad
Facts	TOK encourages me to question the facts	2, 3	Fg
Subject clashing	TOK is radically different from subjects where we just get direct instruction	2	Fg
Ideas	TOK is about using ideas purposefully	2, 1, 4	Fg, Lo, T
Oral language	TOK has helped me to articulate academic matters more coherently	2	Fg
Pointless	Some of the extended discussion work in TOK can be pointless	2	Fg
Passivity	TOK has taught me to be less passive in the classroom	2	Fg
Leadership skills	The TOK questioning mode has helped me with my leadership skills	2, 3	Fg
Question overload	Too many questions can lead to a lack of purpose in TOK	2	Fg, Lo
Moral resolve	Sometimes we just need to learn moral resolve and stop	2	Fg

	asking questions		
Learner profiles	TOK teachers should take more account of the different learner profiles in the classroom	2, 4	Fg, Lo
Logic & ethics	The influence of TOK rests in the application of logic and ethics	3	T
Metacognition	Evidence of student's metacognition is drawn from their TOK journals	3	T, Ad, Da
Philosophy	Good teachers of TOK need to understand philosophy	3	T, Ad, Da
Argument	TOK can help to improve the quality of argument	3	T, Lo
Knowledge assumptions	TOK across the curriculum depends upon the ability to question knowledge assumptions	4	T
Glue	TOK is the glue that holds the curriculum together	4	T
Psychology	TOK links beautifully with psychology	4	Ad
MYP	Students get a chance to think critically in their MYP personal project	4	T
Religion	TOK is now taught separately from religion	4	T, Ad, Da
To tokify	We use the verb 'to tokify' when we apply the TOK mode of thinking to other subjects	4	T, Ad
TOK rigour	TOK makes us more rigorous in all our studies	4	Fg
TOK & science	The practice of TOK can make a subject like science more engaging	4, 1	Fg, T

Key: T-Teacher, Ad- Administration, Fg - Focus groups, Da- Document analysis, Lo –Lesson observation

The coded results for RQ#3 were collapsed into the following qualitative themes by the research team:

1) *Teacher proficiency*
2) *Curriculum organization*
3) *Student meta-cognition*

Appendix L: the coded qualitative results for RQ#4

Code	Description	School	Data Source
TOK workshops	All staff are invited to engage with TOK at our workshops	1, 2	Ad, T
Devotion	The ways of knowing have been integrated into our daily devotions	1	Ad, T, Da
TOK links	All staff are encouraged to use the TOK links from the textbooks	1	Ad
Integrated TOK	TOK is now integrated into everything that we teach	1	Ad, Lo, Da
Student expectations	Students who only want the right answer usually do not do well at TOK	1	Ad, T
Outside of the box	Some students do not like to think outside of the box in TOK	1	T
Clueless	Some students are clueless about TOK at the start of the course	1	T
TOK in art	TOK helps students to see different perspectives in art	1, 4	T, Da, Fg
Metacognition	TOK helps students to think about their learning	1, 2, 3, 4	T, Da, Ad, Lo, Fg
Processes of learning	TOK encourages thinking through the processes of learning	1	T, Ad
TOK cynicism	There are some students and staff who express cynicism to the benefits of TOK	1, 2	T, Ad
Concrete examples	Students appreciate the use of concrete examples in the TOK classroom	1, 4	T
Scepticism	Many staff and student are sceptical about the benefits of TOK	1	T
Critical practice	Many teachers incorporate critical analysis of the knowledge they teach into their lessons	1, 3	T, Lo
Knowledge contestation	Some teachers actively contest the knowledge that they teach	1, 2	T, Lo, Fg
Student maturity	Some students are not mature enough to appreciate TOK	1	T, Ad
ESL	ESL students can struggle with TOK because they can't follow the English cues	1	T
Citizenship	TOK is a forum to discuss the general issues around citizenship	1	T
Open-mindedness	TOK encourages open-mindedness	1, 4	T, Ad, Lo, Fg
Knowledge construction	Some students do not want to construct their own knowledge	1	Fg
Experience	Good TOK classes use student experiences	1, 3, 4	Fg, T, Ad
Lesson focus	It was sometimes very difficult for us to know what the lesson focus was in TOK	1, 4	Fg
Knowledge perspectives	Knowing that there are different perspectives on knowledge does not necessarily help with my thinking	1	Fg
History	TOK has helped me with the evaluation of knowledge claims in history	1	Fg
Assessment	TOK is a very difficult subject to assess well because much of the thinking behind it is unrecognised	1, 2, 4	Fg, T, Ad
Knowledge problems	Understanding a good knowledge problem can be very satisfying	1, 2, 4	Fg, Lo, Da, T
Heads messed up	Some students are very accepting of having their heads messed up by TOK, others are not	2, 4	T
Note taking	Some student only want to take notes and not think for	2	T

	themselves in TOK		
Centre of IB DP	TOK should be at the centre of the IB DP program as it encourages thinking	2	Ad
Essay writing	Students can find the TOK essay especially difficult to write in term of its abstraction	2	Ad
TOK vocabulary	We give the student a vocabulary in TOK through which they can speak about knowledge	2, 3	T
TOK surprise	We often try to surprise the students in TOK who don't know why they are studying a topic until after they have done the research	2	T
Life skill	TOK gives student a life skill to use after school has finished	2	T, Fg
Guests	TOK allows us to schedule in guest speakers to open up the ways that student think	2	Ad, Lo
Learning	TOK is a different way of learning	2	Fg
CT	TOK has helped me with my CT skills	2	Fg
Interpretation	TOK has helped me with the interpretation of events	2	Fg
Discussion work	There is too much discussion work in TOK, which can really be a waste of time	2	Fg
Truth-seeking	TOK has helped me to seek the truth in all aspects of my life	2	Fg
Confidence	TOK has given me the confidence to think about important issues	2, 3	Fg, Lo
Independent thinkers	TOK has helped us to be independent thinkers	2	Fg
Knowledge discovery	TOK should be designed to help discover new knowledge	3	T
Epistemology	TOK is about understanding the epistemology behind the knowledge areas	3, 1	T, Da
CAS	TOK should be more highly connected to CAS and life experience	3	T, Ad
Appropriate pedagogy	Some teachers can find it difficult to find the appropriate pedagogy for TOK	3	Ad
Natural process	Success in TOK is like discovering a natural thinking process	3	Fg
Gullibility	Opening yourself up to the TOK mode of thought can have the unwanted side-effect of making you more gullible	3	Fg
Engagement	Student engagement varies considerably in TOK sessions	4	T, Ad, Lo
Backward mapping	TOK requires teachers to do backward mapping to the knowledge problem	4	T, Ad, Lo
Controversy	Teachers can add academic controversy to enliven their TOK classes	4	T, Lo
Tangible	TOK teachers have to make the subject more tangible for the students	4	T, Lo
Modelling	Good TOK teachers model CT skills in their classrooms	4	T, Ad
Domain descriptors	TOK needs more definite domain descriptors to help with assessment between TOK levels	4	T, Da
Frustration	TOK can be really frustrating because I am constantly taken out of my comfort zone	4	Fg
TOK on paper	TOK can be fine to discuss but impossible to put onto paper	4	Fg, Lo

Key: T-Teacher, Ad- Administration, Fg - Focus groups, Da- Document analysis, Lo –Lesson observation

The coded results for RQ#4 were collapsed into the following qualitative themes by the research team:

1) *Teacher reflexivity*

2) *Student focus*
3) *School atmosphere*