RESEARCH SUMMARY

Theory of knowledge (TOK): Exploring learning outcomes, benefits and perceptions

Based on a research report prepared for the IB by:

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Background

This study examined one of the central elements of the International Baccalaureate (IB) Diploma Programme (DP), the theory of knowledge (TOK) course, within an Australian context. Researchers from the University of Western Sydney investigated IB alumni and current DP student ratings of their critical thinking abilities. The study also explored student perceptions of the role of TOK in supporting critical thinking, as well as TOK teacher ratings of their capacity to teach the TOK course.

TOK "is a course about critical thinking and inquiring into the process of knowing, rather than about learning a specific body of knowledge" (IBO 2013: 8). In TOK classes, students study "knowledge questions" and "knowledge claims" that relate to the nature of knowledge across the curriculum (IBO 2013: 8). 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.

Using four qualitative case studies and open-ended items from survey instruments, the study additionally reports teacher, administrator and student views regarding the learning benefits of TOK and identifies implementation issues experienced in some DP schools. In summary, the study provides important insights into:

1. links between the completion of the DP and students' self-reported academic outcomes, including: perceived critical-thinking skills, academic self-beliefs, and actual and anticipated academic outcomes

2. student, teacher and administrator perceptions of the utility, purpose and content of the TOK curriculum.

A previous study that investigated perceptions of the DP in Australia and New Zealand (Coates, Rosicka and MacMahon-Ball 2007), suggested that the DP offers an excellent grounding in academic skills required for university success, including critical-thinking skills. A key aim of this study has been to further explore this claim.

Research design

Participants in this study included IB and non-IB students completing university studies, TOK teachers, school leaders and TOK students at IB World Schools. Concerning the first of these participant groups, the University of Western Sydney research team distributed the *California Critical Thinking Disposition Inventory* (CCTDI)[1] to a cohort of first-year university students, including both DP graduates and non-DP graduates to allow for comparison. The two groups were also compared based on their Australian Tertiary Admission Rank (ATAR) score, a measure of general academic self-concept and an indicator of their perceived university outcomes. Statistical procedures, including analysis of descriptive statistics, exploratory factor analysis for newly developed scales and multiple regression analysis, were utilized.

With regard to school-based data collection, a survey was administered with current DP students using a number of measurements to assess students' perceived likelihood of employing a variety of critical-thinking skills. Current TOK teachers were also

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[1] 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 in Appendix C in the full report as part of the *University Life* survey.

surveyed about their perceptions of self-efficacy in teaching TOK content and skills. Closed-ended survey items on both instruments were subject to bivariate and multivariate analysis.

In a further component of the study, the research team carried out 22 teacher interviews, 8 student focus groups, 5 administrator interviews, 10 observations of TOK lessons, and document analysis at 4 case study schools. Details of the case study schools are provided in Table 1.

Descriptor	School 1	School 2	School 3	School 4
Suburban/urban	Suburban	Urban	Suburban	Urban
Religious/secular	Religious	Secular	Religious	Religious
Co-ed/Single sex	Co-ed	Co-ed	Single sex (boys)	Single sex (girls)
Public/private	Private	Private	Private	Private
% students in highest quartile of socio-economic advantage	49%	98%	68%	70%

Table 1: Characteristics of case study schools

The total study sample consisted of four case study schools located in the vicinity of Sydney, Australia; 63 IB World Schools from across Australia that took part in teacher and student surveys (1,338 students and 83 teachers); and several cohorts of university undergraduates who completed the CCTDI online evaluation of critical-thinking dispositions and other measures of academic self-beliefs.

Findings

DP graduates' critical-thinking skills

The critical-thinking skills of DP graduates ($n = 99$) were compared to non-DP graduates ($n = 290$) on two measures of critical-thinking skills, the CCTDI and the seven-item *Self-Efficacy for Critical Thinking Scale* (SECT).

The summed mean, measured on a four-point Likert scale from "Very confident" (4) to "Not at all confident" (1), was used in all analysis. DP graduates reported higher scores on the SECT (mean = 3.30, SD = 0.38) than their non-DP peers (SECT mean = 3.08, SD = 0.44), indicating that former DP students were more confident about their ability to use critical-thinking skills than students from non-DP secondary schools. This difference was found to be statistically significant ($t(380) = 4.59$, $p < 0.001$).

Scores on each of the CCTDI subscales can range from 10–60, providing assessment categories of "Low" (10–29), "Ambivalent" (30–40), "Positive" (40–50) and "High" (50–60). With regard to the CCTDI, the mean scores for each of the seven subscales as well as the overall total score were higher for the DP graduates (Table 2). Unfortunately, the sample size for this measure was substantially lower than for the SECT (DP graduates: $n = 42$; non-DP graduates: $n = 126$), so the findings cannot be considered representative.

Dispositional traits	Former 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 Judgment	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 DP students (n = 42); Non-DP students (n = 126)

Table 2: Mean differences on the CCTDI for DP graduates and non-DP graduates at university

First-year university students were also asked to provide information on three additional indicators of postsecondary success: (1) their ATAR score; (2) a 10-item scale measure of general academic self-concept (Marsh 1992); and (3) a 6-item indicator of their perceived university outcomes. The *Academic Self-Concept* (ASC) scale was measured using an eight-point Likert scale, ranging from "Definitely false" (1) to "Definitely true" (8). The items used to measure university outcomes were measured on a four-point scale ranging from "Strongly agree" (4) to "Strongly disagree" (1).

Mean scores for DP graduates and non-DP graduates were compared on these three measures. The DP graduates out-scored the non-DP graduates on each of the measures of postsecondary school success. Further, on each of the measures, differences between mean scores of the two groups were statistically significant (Table 3). First-year undergraduate students who had completed the DP 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 DP students outscored non-DP 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.

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

NB: (*) indicates statistical significance

Table 3: Mean differences in ATAR, ASC and perceived university outcomes by cohort

Current DP students' critical-thinking skills

A nationwide cohort of current TOK students was given the 14-item *Critical Thinking Strategies Scale* (CTSS) to assess students' perceived use of critical-thinking strategies when confronted with new information. The skills referenced in the survey were drawn from leading measures of critical-thinking ability, and items were measured on a seven-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.

Students in year 12 reported a statistically significant higher mean score for the full-scale measure, as well as for 11 of the 14 individual items, pointing to a gain in critical-thinking skills in the move from year 11 to year 12.

Current TOK students were also presented with an additional measure of critical thinking through the 5-item *Critical Thinking* (CT) subscale. Items in the CT subscale are measured using a seven-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). 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 ($t(1240) = 3.04$, $p < 0.01$). The year 12 cohort score was moderately closer to the higher end of the measurement scale.

In sum, quantitative findings revealed apparent gains in the use of critical-thinking skills between the two successive years of the DP (years 11 and 12). Further, students completing their second year of the DP reported a higher likelihood of using an array of critical-thinking skills.

Perceived role of the TOK in supporting critical-thinking skills

Analysis of school-based survey data revealed that students appeared unsure about the contribution of TOK to critical-thinking skills. Students 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. 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"; 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 was measured using a seven-point Likert scale, ranging from "Strongly agree" (7) to "Strongly disagree" (1), with an anchor point of neutrality ("Neither agree nor disagree" [4]).

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 (n = 1242); (*) indicates statistical significance.

Table 4: Mean differences in students' perceived outcomes of TOK study, by year cohort

Scores for these two variables were examined between year 11 and year 12 students of TOK. As shown in Table 4, 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 4.

Teacher and student perceptions of the TOK course

One of the areas of interest for the study was teachers' self-beliefs around the teaching of TOK content and skills. The *Theory of Knowledge Teachers' Self-Efficacy Beliefs* scale measured teachers' self-efficacy beliefs with regards to TOK teaching. Teachers' mean scores were highest on the three items related to critical thinking [Mean = 8.94 (1.44)], questioning assumptions [Mean = 8.81 (1.71)] and acknowledging interconnected systems [Mean = 8.73 (1.55)]. Interestingly, teachers' lowest self-efficacy scores were related to the area of assessment, using "various assessment strategies" [Mean = 7.89 (1.84)] and "gauging student comprehension" [Mean = 8.01 (1.81)]. 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 the course.

TOK teachers were also asked specifically about how other staff members at their school perceived the TOK course. This item elicited 71 independent responses. While a small group of TOK teachers indicated strictly positive staff perceptions (*n* = 13), the larger majority indicated mixed responses. A noteworthy thread of responses (*n* = 19) described a sense of "mystery" surrounding the TOK course among non-TOK staff, highlighting a lack of understanding about TOK. Of those who described negative staff perceptions (*n* = 14), many suggested that other staff members did not want to teach TOK due a perceived larger teaching load as well as the sense that it wasn't "worth it" due to the small contribution to the overall IB grade.

The study likewise elicited a variety of responses from the four case study schools, some of which echoed survey findings, as can be seen in Table 5.

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

Table 5: Positive and negative teacher perceptions of TOK in the case study schools

Case study findings suggested that students also held varied perceptions of TOK. Some students reported that TOK had significantly helped with DP studies, giving them insight into various knowledge issues and building analytical and thinking skills. Negative perceptions from students focused on the over-reliance on vague and circular discussion as well as the lack of relevance and purpose of some of the sessions. Overall, students were generally ambivalent with regard to the perceived benefits of TOK.

The impact of the TOK on other subjects

Lastly, there were several items in the TOK teacher survey that addressed the connection between the TOK curriculum and other areas of secondary students' study. 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 DP. 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. 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."

Nevertheless, participants indicated it was at times difficult to get teachers in other subject areas to make these connections in their classrooms. Case study analysis suggested that explicit connections between TOK and other areas of the DP varied across the four schools, with some schools making shared knowledge of TOK a whole-school priority, while others reported non-TOK teachers' resistance to engaging with TOK content and pedagogical approaches.

Another challenge identified through the qualitative research was that teachers and administrators have to balance the rigorous requirements of the DP with the need to devote sufficient time to the study of TOK, so that students can properly understand both TOK and the six subject areas.

Discussion

This study provides further support to the proposition raised by Coates, Rosicka and MacMahon-Ball that the DP fosters skills that are useful for university success, such as critical thinking. Current DP students self-reported that they are likely to use critical-thinking skills in a variety of situations. These skills also appear to increase from year 11 to year 12. Additionally, DP graduates generally had higher CCTDI scores than non-DP graduates at the university level and outscored DP students in self-appraisals of academic self-concept and anticipated university outcomes.

At the same time, there is some evidence that DP students may not fully see the value of the TOK course. Students perceived less value of TOK for "lifeworld skills" and only marginally agreed that TOK contributed to critical-thinking skills. Some students also criticized TOK as being over-reliant on circular or vague classroom discussions. Among other challenges, TOK teachers reported a lack of integration of TOK into other subjects as well as a lack of understanding and support from some non-TOK teachers. These areas require further reflection in order to enhance the impact and effectiveness of the TOK course.

Recommendations for further consideration

The following recommendations emerged from the study findings.

- Encourage the integration of TOK into all subject areas by:

    – providing professional development for teachers on teaching critical thinking

    – asking teachers to consider current knowledge issues in their fields

    – having ongoing discussions among staff and offering examples of ways to apply TOK lessons across disciplines

    – building collaboration between TOK teachers, CAS coordinators and extended essay supervisors to create mutually supporting linkages

    – providing an easy-to-access and understandable guide on the benefits of TOK for all members of IB World Schools.

- Institute concise and well-constructed formative assessment methods for TOK and the critical-thinking skills necessary for DP success.

- Develop a more detailed understanding of how students can progress in their critical-thinking skills over the course of TOK sessions.

- Develop international networks of IB World Schools that analyse and discuss knowledge problems from a variety of political, cultural and social perspectives.

- Start a student-led publishing journal or academic blog for TOK and critical thinking between schools, countries and continents.

- Utilize "TOK friendly" texts and high-quality stimulus materials to create engaging lesson plans and to enable structured class discussions.

References

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