Teaching the Theory of Knowledge course in IB World Schools

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November 2015

The authors would like to acknowledge the contributions of the International Baccalaureate Global Research Department. We greatly appreciate the feedback on drafts and the work facilitating research activities associated with the project. In particular, we would like to express our gratitude to Brad Shrimpton for his comprehensive guidance. Olivia Halic and Alison Smith provided invaluable support for which we are grateful. Additionally, we would like to thank the International Baccalaureate Regional and Global Outreach Departments that helped facilitate focus groups. We would like to thank Dr. Douglas Baumann and his student assistants from the University of Wisconsin-La Crosse for proofreading the final report and providing feedback.

And, most importantly, we would like to thank the International Baccalaureate teachers and coordinators who not only inspired our work, but also gave their time to this project.

Abstract

This research used a mixed methods design to investigate the impact, perceptions, and implementation of the TOK course in IB schools worldwide. To address the research questions, quantitative survey data was analyzed from 1,534 participants and focus groups with 33 TOK teachers were conducted in Australia, The Netherlands, and the United States.

Overwhelmingly, survey results indicated that teachers enjoy teaching the TOK course. The teachers ranked the main purposes of the TOK course as 1) to develop an awareness of how knowledge is constructed, critically examined, and renewed by individuals and communities and 2) to help students make connections between academic disciplines and between thoughts, feelings and actions. Teachers ranked the main benefits to students as 1) students better able to critically evaluate knowledge and 2) students better able to identify and reflect on personal assumptions. Teachers strongly agreed that teaching TOK has been a valuable professional development experience for them. Specifically, they indicated it enhanced their own critical thinking and 2) developed their interdisciplinary understanding. Survey results and focus groups suggest the main challenges are 1) assessment, 2) time, and 3) administrative issues (scheduling and class size). Regarding implementation, approximately half of TOK coordinators indicated that TOK implementation was different than other IB programme aspects, most cited that teacher support and time were different than other IB programme aspects.

Introduction

Background

The International Baccalaureate (IB) is a non-profit educational foundation, motivated by its mission to develop inquiring, knowledgeable and caring young people who help create a better and more peaceful world through intercultural understanding and respect (IBO, 2015b). Founded in 1968, the organization currently works with more than 4,162 schools in over 140 countries to develop and offer four challenging programs to students aged 3 to 19 years (IBO, 2015a). The IB Primary Years Programme (PYP), for students aged 3 to 12, focuses on the development of the whole child as an inquirer, both in the classroom and in the world outside. The IB Middle Years Programme (MYP), for students aged 11 to 16, provides a framework of academic challenge that encourages students to embrace and understand the connections between traditional subjects and the real world. The IB Diploma Programme (DP), for students aged 16 to 19, is an academically challenging and balanced programme of education with final examinations that prepares students for success at university and

beyond. The IB Career-related Certificate (IBCC), for students aged 16 to 19, is the newest offering from the IB. The IBCC incorporates the vision and educational principles of the IB Programmes into a unique offering specifically designed for students who wish to engage in career-related learning. The IB works with state and privately funded schools around the world that share a commitment to quality international education. The organisation also provides professional development workshops for more than 60,000 teachers and administrators annually (IBO, 2015b).

Theory of knowledge. As a part of the International Baccalaureate Organization (IBO) Diploma Programme (DP) students participate in the theory of knowledge (TOK) course. This course is designed to develop student understanding of knowledge and the process of knowing. Previous research (Cole, Gannon, Ullman, & Rooney, 2014) examined student learning outcomes and teacher perceptions of TOK in four case study schools, focusing on the critical thinking aspects of TOK. Research investigating teacher views of the TOK course and school implementation practices on a larger scale is needed to not only inform the development of TOK courses for IB educators in over 2600 schools worldwide, but also to contribute insights into teaching about the nature and process of knowing in secondary schools.

The IB learner profile. IB World Schools value the development of internationally minded global citizens as stated in numerous IB materials, guides, and website (see IBO, 2015b). The IB learner profile is the IB mission statement operationalized into a set of learning outcomes for students. The attributes of the profile articulate the values of IB World Schools and provide a consistent long-term vision of education across schools. The learner profile strives to articulate academic and nonacademic elements of a well-rounded international education. The learner profile describes IB learners as: inquirers, knowledgeable, thinkers, communicators, principled, open-minded, communicators, risk-takers, and balanced (IBO, 2015b). The IB learner profile attributes are further described by the IBO, "We believe these attributes, and others like them, can help individuals and groups become responsible members of local, national and global communities" (IBO, 2008).

Rationale and Purpose of the Study

This study is informed by two bodies of knowledge: 1) implementation, philosophies and approaches inherent to the International Baccalaureate DP and 2) theories related to understanding the nature and process of knowing.

Previous research has examined individual components of the DP (see Billig, 2013; Inkelas, Swan, Pretlow, & Jones, 2013; Cole, Gannon, Ullman, & Rooney, 2014) and the DP holistically (see Coates,

Rosicka, & MacMahon-Ball, 2007; Coca, Johnson, Kelley-Kemple, Roderick, Moeller, Williams, & Moragne, 2012). Generally findings suggest that IB participation prepares students for postsecondary coursework (Caspary 2011; HESA, 2011; Coca et al., 2012), improves secondary school academic performance (Caspary, 2011; Saavedra, 2011; Wade, 2011), and postsecondary enrollment and persistence (Coca et al, 2011, Caspary & Bland, 2011; HESA, 2011; Inkelas, Swan, Pretlow, and Jones, 2013). Research on core components of the DP (extended essay (EE), theory of knowledge (TOK), and creativity, action, and service (CAS)) suggest positive outcomes for students, but also insight into areas of improvement. Inkelas's 2013 report exploring the benefits of the extended essay suggests the EE serves as good preparation for university level research, but that IB schools could improve the EE experience by providing more support on specific aspects of the research process. Similarly, Billig's 2013 report on CAS suggests that students do develop their civic-mindedness through CAS, but schools could improve the experience by deepening the reflection process. Findings from the multiple studies on CAS and EE are essential to developing those experiences for students worldwide. Large-scale research on implementation, perceptions, and impact of the TOK is needed to inform the development of the TOK course and ways of knowing scholars.

To properly explore the implementation and impact of TOK it is crucial to understand the underlying philosophy of this course. As suggested by the name, TOK students explore the generation and understanding of knowledge. This discourse examines the psychological and sociocultural construction of knowledge. It is important to distinguish the IB TOK course from a philosophy course. While TOK might include some components similar to a philosophy course (such as discussion of philosophers), they are distinct courses with unique objectives. Foundational information in a TOK course could include philosophical readings from Plato[1], Descartes[2], Locke[3], and Kant[4]. But, TOK is designed to address specific areas of knowledge[5] and ways of knowing[6]. The course often includes discussions surrounding generalizations, what is knowing, how do we know, search for truth, persuasion, knowledge in the world (see Theory of Knowledge Course Companion[7], Dombrowski, Rotenberg, Bick, 2007).

[1] Plato's Allegory of the Cave (Plato, trans. 1993, p. 514-533d) is often considered foundational reading for all interested in epistemology
[2] Discourse on method and related writings (Descartes, 1637)
[3] An Essay Concerning Human Understanding (Locke, 1690)
[4] Critique of Pure Reason (Kant, 1781)
[5] Ethics, history, human sciences, indigenous knowledge systems, mathematics, natural sciences, religious knowledge systems, and arts
[6] Emotion, faith, imagination, instinct, intuition, language, memory, reason, sense perception
[7] Developed in collaboration with the IBO, but an independent book not published by the IBO

The findings from this research will offer insights to inform the ongoing development of the Theory of Knowledge course. This study is guided by the ten research questions listed below.

Research questions

Perceptions of the TOK

1. What are teachers' views of the TOK course? What are teacher perspectives' regarding:
    a. the purpose of teaching the TOK
    b. the benefits to students and schools of TOK teaching and learning
    c. challenges experienced when teaching TOK
    d. the effort needed to teach TOK
    e. success factors that underpin quality TOK courses?
2. To what extent do teachers believe that the learning outcomes of TOK impact student learning in DP subjects and other elements of the core?
3. In what ways do TOK teachers believe that the theory of knowledge course prepares students for future success? To what degree do they think that the TOK develops skills/characteristics of the learner profile?

Impact on Teachers

4. What is the relationship between teaching the theory of knowledge course and the following:
    a. pedagogical beliefs, intentions, and practices
    b. teacher self-efficacy?
5. To what extent do IB teachers perceive teaching TOK as being a valuable development experience as a teacher? And, in what ways?
6. What reasons do teachers give for why they choose to teach the theory of knowledge course?
    a. If they are assigned to teach TOK, what do they believe are the reasons for their assignment?

Implementation Questions

7. How is the theory of knowledge course implemented in IB World schools? How is implementation of TOK different from and similar to other core components of the IB programme?
    a. What roles do DP coordinators, administrators, and teachers play in the implementation of the TOK course?
    b. How are TOK teachers selected, hired, and evaluated?
8. In what ways do teachers prepare students for the TOK in class oral presentation? And, in what ways does the administration support their efforts?
    a. How are student communication and metacognitive skills developed in the TOK course?
9. What do TOK teachers do to link to the TOK to other subjects in meaningful ways? How is collaboration with other TOK and non-TOK teachers structured?
10. To what extent are recent changes to the TOK being adopted and implemented by DP schools?
    a. What are teacher views of the new WOKs, AOKs and Knowledge framework?

Literature Review

The primary purpose of this study was to examine International Baccalaureate (IB) teachers' beliefs about the TOK course; from *overall perceptions* (e.g., What is the purpose of the TOK course?) to *specific perceptions* related to *teacher impact* (e.g., Did teaching TOK impact teachers' pedagogical beliefs, intentions, teaching practices, and/or teacher efficacy?) and *implementation (*e.g., What implementation approaches do teachers feel make the TOK course most effective?). This study was guided by the extant literature related to (1) the construct of teacher beliefs and the impact those beliefs have on teaching practices and (2) the implementation, philosophies and approaches inherent to the IBDP.

Teacher beliefs. Critical to the current investigation is a review of the extant literature related to teachers' beliefs. Much has been written about teachers' beliefs and the impact those beliefs have on pedagogical practices (Bergeron & Dean, 2013; Fang, 1996; Fives & Gill, 2015). While it is agreed that teachers' beliefs are not static, stable or overly simplistic constructs, there are certain links between beliefs and practices that have been well established in the nearly 700 empirical studies that have been published related to this topic over the past 60 years (Fives & Gill, 2015). It is clear that a relationship exists between teachers' beliefs and teachers' practices (Buehl, & Beck, 2015). There is much evidence to support the relationships that may exist between teachers' beliefs and teachers' practices, but caution should be used when drawing conclusions. Buehl and Beck (2015) reviewed research published between 2008 and 2012 that examined this relationship. They concluded that beliefs influence practice and practice influences beliefs. The influence of beliefs on practice is evident in Wilkins' (2008) study of 481 elementary teachers. These teachers were asked to share their beliefs about the effectiveness of inquiry teaching. Wilkins (2008) found that these beliefs were the strongest direct predictor of a teacher using inquiry instructional practices. Additionally, Bergeron and Dean (2013) utilized the Teaching Perspectives Inventory (TPI) developed by Pratt, Collins, and Selinger (2001) to examine the relationship between teacher beliefs and being an effective IB teacher. The results from the information obtained via survey submissions and focus group participation revealed that IB teachers' "beliefs about teaching" were different from their non-IB counterparts and that these specific beliefs (i.e., global or international perspective or social responsibility) informed their instructional practice. Second, evidence supporting the assertion that teachers' practices influences teachers' beliefs was primarily drawn from studies in which the teaching practice included teaching critical thinking skills, the importance of self-efficacy beliefs, or other ability-related skills. Teaching those specific practices has been shown to positively affect teachers' beliefs, especially when teachers experience success in those teaching

practices (Buehl, & Beck, 2015). It is suggested in previous research (Cole, Gannon, Ullman, & Rooney, 2014) that TOK teaching includes teaching critical thinking. If that is the case, it could be argued that TOK teachers' beliefs might be impacted by teaching a course with an emphasis on critical thinking. The relationships between beliefs and practices should be interpreted with caution, as Buehl and Beck (2015) also highlighted several studies in which there were inconsistencies between teacher reported beliefs and actual teaching practices. It is important when drawing conclusions to understand the complexity of these relationships, identify variables that may influence the relationship (e.g., the teacher's level of development and expertise), and be aware of the methods for documenting beliefs (e.g., self-reported data).

Ertmer, Ottenbreit-Leftwich, and Tondeur (2015) suggest that examining an area in which teachers may be more likely to have to change the nature of their instruction and adopt new tools is a critical context to consider when evaluating the relationship between teachers' beliefs and practices. For example, Ertmer, Ottenbreit-Leftwich, and Tondeur (2015) reviewed teachers' beliefs research that included practices in which teachers were using digital technologies to support 21st-century teaching and learning. Ertmer and her colleagues suggested that teachers use of digital technologies highlights teaching that focuses on 21st-century skills – defined here, in part, as including learning that emphasizes the importance of allowing students to engage in experiences that have authentic problems. The researchers also indicated that the specific teaching practice of incorporating digital technologies often requires teachers to adopt new pedagogical practices.

Teacher beliefs about students. While not directly related to the subject of this research, it is important to acknowledge the research surrounding teacher beliefs about students. It has been established that teachers' judgements of students' ability are often influenced by their beliefs (Fives & Buehl, 2012). This is often called the Pygmalion effect, Rosenthal effect, expectancy beliefs, or observer-expectancy effect. Robert Rosenthal and Lenore Jacobson (1968) established this concept in the education literature with their 1968 study examining the impact of teacher expectations on student performance. They concluded that higher expectations of students lead to an increase in student performance (Rosenthal & Jacobson, 1968; Mitchell & Daniels, 2003). Teacher expectations have been shown to impact treatment of students, eventually leading to self-fulfilling prophecies (Rosenthal & Jacobson, 1968).

Previous TOK research. Having examined the construct of teacher beliefs and the significant impact those beliefs have on teaching practices and student outcomes, it is important to set the stage

for this study by reviewing the relevant findings from previous TOK studies. Two recently published studies have examined the impact of the TOK (Cole, Gannon, Ullman, & Rooney, 2014; Wright & Lee, 2014). In both cases, TOK effectiveness was, in part, evaluated based on TOK teacher beliefs. Cole and his colleagues (2014) - after surveying 83 TOK teachers and interviewing an additional 22 TOK teachers working at several Australian IB schools – reported that the majority of TOK teachers felt that the TOK course had positive outcomes, which include improving students' critical thinking skills. Less clear from the results was the extent to which TOK teachers felt that the TOK course had positively impacted student learning in other DP subjects. Additionally, it was unclear what specific areas inhibited the success of the TOK course, although several possible areas were suggested (e.g., the broad scope of the TOK course, the challenge of teaching the TOK course, the lack of school community support such as when the TOK course is not prioritized within a school community).

Wright and Lee (2014) also investigated the effectiveness of various IBDP core requirements, to include the TOK course. Their multi-site case study resulted in 27 IBDP teachers and administrators at five different schools in Beijing and Shanghai (IBDP stakeholders) sharing their thoughts specifically related to the following questions: Which features of the three IBDP "core requirements" contributed the most to developing 21st century skills. Throughout the interviews, the TOK course "was argued to be highly relevant to cognitive skills, principally critical thinking" (p. 211). Wright and Lee highlighted the positive comments made by the TOK teachers . Comments indicated that TOK teachers felt that the TOK course was key to developing 21st century skills including critical thinking, open mindedness and self-reflection. Another theme reported related to "underprioritizing". "Teachers and administrators highlighted that an implication was that "Core Requirements", which have less weight in the final IBDP grade, could be under-prioritised" (p. 210). Both research groups sought to better understand the effectiveness of the TOK course by asking those closest to it – the TOK teachers. In our current examination, we advance two lines of research – that related to teachers' beliefs and research related specifically to the perceived effectiveness of the TOK.

Methods

Research Design

In order to gain a better understanding of the TOK course, this project uses a mixed methods design to investigate the impact, perceptions, and implementation of the TOK course in IB schools worldwide.

The benefit of the mixed methods design is that it capitalizes on the strengths of both quantitative and qualitative research (Greene, 2007). To address the research questions, quantitative analysis of survey items was combined with qualitative analysis of open-ended survey items and focus group transcripts. Using an explanatory sequential design (Creswell, 2008) the research team collected and analyzed data in two phases. Phase 1 consisted of collection and analysis of survey data. Phase 2 consisted of collection and analysis of qualitative focus group data. The purpose was to use qualitative results to assist in explaining and interpreting the quantitative findings. While Phase 1 was mostly quantitative, several open-ended items requiring qualitative analysis were also included. Open-ended questions enabled the participant to create the response unconstrained by the researcher's views (Creswell 2008). Open-ended items from the survey were analyzed with the focus group transcripts. Open-ended responses received in French and Spanish were translated to English prior to analysis.

Survey methods. Research questions were addressed using a researcher designed survey, The TOK Survey. The online survey was sent in the three official languages of the IB to all Diploma Programme (DP) Coordinators[8] with the request that in addition to completing the "coordinator items" they also forward the survey to TOK teachers. The survey link was open for 17 days. Survey responses were received from 2,079 participants, but 545 responses were not included because role was not identified (see Table 1 for description of respondent background. Note full background details are in Appendix A). The survey design included testing logic that directed respondents to survey items based on the primary role they identified. Therefore, those who did not identify a role were not directed to the in-depth questions. Only responses that identified a role were included in the analysis. Nine hundred and sixty (960) respondents identified their primary role as teacher, and approximately 750 of these respondents answered the majority of the survey items. Five hundred and eighty five (585) respondents identified their primary role as DP Coordinator, and approximately 525 of these respondents answered all of the items. Items 1-10 were available to all respondents. The survey branched after item 10, directing teachers to answer items 11-45 on survey A and DP Coordinators to items 11-23 on survey B. Missing values were removed from the analysis, but the respondent was not removed. Generally, missing data was found following the initial background questions (1-10) when the survey branched into role specific questions, explaining why more information is available for the background questions. All available data was included in the analysis.

[8] DP Coordinators are school-based personnel (either teachers or administrators) who oversee the daily activities of the school DP.

Table 1

Respondent background information

	Frequency	Percent
Gender		
Don't want to say	16	1.0
Female	773	50.4
Male	745	48.5
Other	1	.1
highest degree or level of education		
bachelor's degree	413	26.9
master's degree	931	60.7
doctoral degree	145	9.5
other	45	2.9
Years teaching experience (teacher role only)		
1-3	40	4.7
4-6	69	8.1
7-9	98	11.5
10-12	123	14.5
More than 12	521	61.2

Survey quantitative analysis. The researcher constructed survey, The TOK survey, included a set of items intended as a scale measuring teacher confidence teaching TOK. Therefore, in addition to the quantitative analysis aimed at answering the research questions an additional set of procedures was used to explore the scale. The research questions were addressed using descriptive statistics, independent samples t-tests, and an analysis of variance (ANOVA). Prior to addressing the research questions internal reliability (Cronbach's alpha), how well multiple items on a scale measure the same characteristic, was used to evaluate the constructed scale measuring teaching confidence (CTT scale). The threshold of Cronbach's alpha of .7 or higher was used to determine if the scale items met the reliability criteria for being analyzed as a scale. Following the reliability analysis, exploratory factor analysis (EFA) with principle component extraction was performed to further investigate the nature of the scale and items. Group differences on confidence teaching TOK, challenges teaching TOK, and success teaching TOK were investigated using independent samples t-test and ANOVA. Previous research suggests that differences may exist between countries (Dean & Bergeron, 2015), years teaching experience (Falk, 2013), and class size (Chingos, 2012). Therefore these background factors were investigated. Country was categorized into two categories (US and non-US) because of the large percentage of responses from the US. Because only two populations exist for country (US and non-US),

independent samples t-test was used. ANOVA was used to analyze group differences on selected survey responses with more than two grouping categories. While multiple ANOVA[9]s have their risks, ANOVA is generally considered robust to violations of the normality assumption (Mertler and Vannatta, 2009) and appropriate when examining if categories have different effects[10]. Descriptives are discussed in the results section and provided in Appendix A.

Focus group methods. Focus groups were held between June 2015 and August 2015. Locations for focus groups were selected to represent a variety of regions (Table 2). A variety of recruitment efforts were used to solicit the voluntary participation at each of the events in these regions. First, approximately one month (and again two weeks) prior to each event, the IB Events Managers sent out email solicitations to all individuals registered for TOK workshops. Within the email, potential participants were informed of the focus group's purpose and provided with a link to register for one of three sessions.

Sample. As displayed in Table 2, between 5 (Brisbane) and 20 (Chicago) individuals registered for a focus group session based on these initial solicitations. Additional recruitment efforts were used to increase the total number of registrants. These efforts included IB officials and TOK workshop leaders reminding workshop participants of the opportunity during opening remarks and individual TOK sessions (all events) and the second author soliciting participation through email (contacting TOK coordinators at local IB schools) or direct contact (speaking to individuals during their TOK workshop session; Brisbane). The combined recruitment efforts were successful and resulted in two one-hour long focus group sessions being scheduled. Due to cancellations at each event and low numbers in some sessions, the Event Managers at each site recommended combining focus groups, which resulted in one focus group occurring at each event.

The second author conducted three separate hour-long focus groups at the IB events highlighted in Table 2. The total number of participants at each event ranged from 4 (Amsterdam) to 15 (Brisbane) and comprised 33 teachers (13 males, 20 females) with a variety of experiences working with

[9] Categories were merged to create fewer categories based on logical groupings. However, categorizing the data can result in the loss of important information. The risk of Type I error increases if more than one ANOVA on the same data is performed.

[10] While normality of the data was initially questionable it was evaluated and determined trivial. Given the purpose of the analyses and trivial nonnormality data transformations and non-parametric alternatives to ANOVA were not performed.

the TOK curriculum (either as a TOK teacher, workshop leader, or administrator). Individuals represented a wide range of experience (total number of years teaching TOK ranged from 1 to 28). Focus group participants were currently working at IB schools located in nine different countries: Australia, Canada, Finland, Germany, Japan, Poland, Singapore, Sweden and the United States. The majority of the participants were currently teaching at IB schools located in Australia (11/33; 33%) or in the United States (13/33, 39%).

Table 2
Focus Group Description

Date	Location	Description	Registered	Attended
06/20/15	Amsterdam	IB Professional Development/ Workshop	9	4
07/09/15	Brisbane	IB Professional Development/ Workshop	5	15
07/24/15	Chicago	IB Annual Regional Conference	20	14

Data Collection. The focus groups took place in an undisturbed classroom (Amsterdam), library (Brisbane) or conference room (Chicago). The second author was the moderator at these events and led the sessions by following the 6-item protocol, which had been developed to help answer the research questions posed in this study (see Appendix B). The second author followed the guiding questions and asked questions when clarifications were needed. All sessions were recorded and later transcribed for data analysis purposes.

Analysis

Qualitative coding of focus group data and open ended survey items. The focus group transcriptions and responses from open-ended survey questions were analyzed collectively using an inductive approach (Maxwell, 2005). The data were coded and analyzed in NVivo 9 Software. Line-by-line open coding technique (Glaser & Strauss, 2009) was used and each sentence was coded with at

least one code. To maintain authenticity, participant's own words were used to create the codes as much as possible. The same codes were consistently used to code text that represented the idea, not necessarily an exact word match. For example, many respondents discussed the importance of *connections*. Text was coded *connections* anytime the idea was mentioned, not just the term. A constant comparison method (Glaser & Strauss, 2009) was used to systematically compare and allocate codes. Codes were adjusted or created based on new understandings that emerged (Schilling, 2006). Similar codes were combined and organized into descriptive categories facilitating a more efficient analysis. In addition to the line by line coding, word frequency query was used to identify the most frequently occurring words in selected sources. The sensitivity of the word frequency query was adjusted to include results with the same stem and synonyms.

Limitations. This research relied heavily on self-reported data. Self-report data is vulnerable to social desirability to report specific perceptions and practices. Additionally, the teachers that chose to respond to the survey and participate in focus groups might not reflect the population of IB teachers.

Instruments

The TOK Survey. A researcher created survey was developed for this project, The TOK Survey (see Appendix A). The survey was comprised of 3 sections. The first section contained 10 background questions for all participants. The second section, Survey A, contained 35 additional items for TOK teachers. The final section, Survey B, contained 13 additional items for DP Coordinators. TOK Teachers were therefore asked a total of 43 items and DP Coordinators were asked a total of 23 items. Contained in Survey A was a set of items intended to measure one single construct, confidence teaching the TOK. Items 31-41 are referred to as the Confidence Teaching TOK (CTT) scale. The term confidence is used in this research to describe teachers' self-view regarding ability to successfully teach TOK. A related, but different, term 'self-efficacy' is not used because there are distinct differences between the terms even though some overlap exists (Hudson, Kloosterman, & Galindo, 2012). Confidence is often viewed as a more general term (Bandura, 1997) and sometimes as a descriptor of strength of the belief only (Bandura, 1997). However, for the purpose of this research, teaching confidence refers to the strength and certainty of the belief in one's teaching ability (Baxter, Ruzicka, Beghetto, & Livelybrooks, 2014; Hudson, Kloosterman, & Galindo, 2012). Teaching self-efficacy refers to a belief in oneself to perform and successfully complete the tasks of teaching (Bandura, 1997) along with the specific instruments related to teaching self-efficacy (see Bandura 2006; Pruski, et al., 2013). Self-efficacy is generally a more precise term and is supported by substantial research by Albert Bandura (Bandura, 1989; 1997; 2006)

and others (see Bruce & Ross, 2008; Goddard, Hoy, & Woolfolk Hoy, 2004; Joët, Bressoux, and Usher, 2011; Tschannen-Moran & Woolfolk Hoy, 2001; Zimmerman 2008).

Confidence Teaching TOK (CTT) scale. Items 31-41 were designed to measure teacher confidence teaching TOK. Analysis of internal reliability suggests that the items measure the same characteristic (see Table 3), and could be evaluated as a scale.

Table 3
Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	# of Items
.798	.808	11

It is suggested that removing items would not improve the reliability (see Table 4), therefore the 11 items tested were all included on the Confidence Teaching TOK (CTT) scale.

Table 4
Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
item31	32.64	21.51	.433	.227	.785
item32	33.13	21.43	.331	.134	.794
item33	32.76	21.27	.418	.215	.785
item34	33.24	19.63	.442	.364	.785
item35	32.76	20.40	.487	.463	.778
item36	32.49	20.66	.586	.469	.772
item37	32.50	20.94	.488	.368	.779
item38	32.59	20.44	.499	.335	.777
item39	32.48	20.95	.483	.326	.780
item40	32.90	19.30	.510	.430	.776
item41	33.36	19.22	.442	.359	.787

Further analysis of the CTT scale was performed using exploratory factor analysis (EFA) with principle component extraction (PCA). To ensure the accuracy of the analysis, data screening tests were performed. With a sample size close to 1,000 the estimated reliability is “excellent” (Mertler and

Vannatta, 2009). The Kaiser-Meyer-Olkin (KMO) statistic (.801)[11] confirms adequate sample size. However, to ensure the data is appropriate for factor analysis with principal component extraction additional analysis screening tests were analyzed. The Mahalanobis distance test was used to determine if outliers existed[12], 13 cases were identified and removed after it was determined they represented "too perfect" scores indicating blind completion or instrumentation error. A correlation matrix (see Appendix D) was used to ensure that components were sufficiently intercorrelated to conduct a principal component analysis (Mertler and Vannatta, 2009). It was expected that the items would correlate, but not too highly/perfectly (multicollinearity and singularity). Bartlett's test of sphericity produced significant results suggesting singularity is not an issue. The determinant of the correlation matrix (.059) was greater than 0.00001, suggesting there is no multicollinearity (Mertler and Vannatta, 2009). Additionally, the values on the diagonal of the anti-image matrix of covariances and correlations (see Appendix D) are greater than 0.5, suggesting adequate sample.

Three methods of interpretation of the analysis were considered: 1) Kaiser's rule, 2) scree plot, and 3) total variance. Kaiser's rule states that only components with eigenvalues greater than 1 should be retained. Three components have eigenvalues greater than 1 (see Appendix D). However, Kaiser's rule can overestimate the number of factors (Bandalos & Boehm-Kaufman, 2009). Examination of the scree plot (see Appendix D) suggests that one to two components could be retained as the graph declines sharply after the first component and levels off after the second component. Examination of the factors that account for total variance suggests that up to 5 factors should be retained (see Appendix D). It is most appropriate to evaluate eigenvalues in conjunction with the scree plot. The scree plot is an appropriate determinant because not all the communalities are greater than .70 nor is the average greater than .60 (see Appendix D). The scree plot has been demonstrated to be accurate with communalities greater than .30 with large samples (Mertler and Vannatta, 2009). Given that the first factor[13] is nearly 3 times the size of the second factor[14] and the sharp drop in the scree plot between factor 1 and 2 it is reasonable to retain 1 factor. The component matrix (see Appendix D) was used to

[11] values between .8 and .9 are generally considered "great" (Hutcheson & Sofroniou, 1999) and indicate adequate sample

[12] The Mahalanobis distance test resulted in a new variable, MAH_1, which was tested using chi-squared criteria. Outliers were indicated by chi-square values that were significant at p <.001 with 11 degrees of freedom. The critical value of chi-squared at p <.001 and df=11 is 31.26. Therefore, cases with a MAH_1 greater than 31.26 are considered outliers (Mertler and Vannatta, 2009); thirteen outliers were identified and removed from the analysis.

[13] 3.810

[14] 1.333

identify which variables shared common components. One underlying factor was identified[15]. Component 1, also factor 1, included all 11 items (items 31-41). This suggests that the CTT scale is organized by one underlying component. The internal reliability testing also suggested all items measure the same characteristic. Therefore, the analysis of TOK teaching confidence will examine confidence using a scale score of all 11 CTT items.

Focus group protocol. As indicated earlier, the second author served as moderators for each of the three focus group sessions and used consistent procedures throughout (see Appendix B). The sessions began with the moderator stating the purpose of the TOK focus group. Sessions continued with the moderator asking and listening to discussions on the following topics: overall experience with the TOK; perception of the TOK (its purpose, benefits, and challenges); effort needed to teach the TOK; impact of the TOK (student and teacher); and the importance of a teacher's approach or teacher efficacy when teaching the TOK curriculum.

Results

The results section is organized by research question category. Research questions were organized into three categories: perceptions of TOK, impact on teachers, and TOK implementation.

Research questions 1-3: Views of TOK; relationship between learning outcomes of TOK and student learning; TOK as preparation for future success

Research questions 1, 2, and 3 explored perceptions of TOK. Descriptive statistics[16], independent samples t-tests, and ANOVA were used to explore The TOK Survey results. Qualitative coding was used to interpret the focus group results and open ended survey items.

Descriptive statistics. Complete descriptive statistics for each survey item are available in the appendix (see Appendix A). Survey A items 15-22 and 24-26[17] address teacher perceptions of TOK.

[15] When 1 factor is extracted, the factor loadings for each variable are all greater than .4. For interpretive purposes with a large sample size such as this, greater than .4 is considered fair (Stevens, 1992). There is not one established cut-off score; depending on the research different cutoff scores are used ranging from .2 to .8 (Stevens, 1992; Mertler and Vannatta, 2009).

[16] Please note that in light of current debate surrounding the treatment of Likert items as continuous variables the means presented should be interpreted with caution. It is suggested (see Jamieson, 2004) because Likert item scales are ordered categories the intervals between the scale values are not equal. Therefore, numerical calculations, such as mean, are not valid. However, others suggest that using Likert scale items in parametric tests is acceptable in certain situations (see Lubke & Muthen, 2004).

[17] Appendix A pages 50-54

Overwhelmingly, teachers in this sample indicated that they enjoy teaching the TOK course (86.5%) with only a small number of respondents (2.3%) indicating they did not. The teachers also indicated that teacher interest was the most important contributor to the success of the TOK course (this item had the lowest mean rank (2.89, *SD*=2.26), therefore being ranked 1st among success options). The next two highest ranked contributors to TOK success were student interest (4.27, *SD*= 2.61) and class size (5.54, *SD*=2.39). The teachers ranked the main purposes of the TOK course as 1) to develop an awareness of how knowledge is constructed, critically examined, and renewed by individuals and communities (M=1.80, SD=1.28); 2) to help students make connections between academic disciplines and between thoughts, feelings and actions (*M*=2.90, *SD*=1.18); and 3) to help students develop an awareness of personal and ideological assumptions (*M*=3.01, *SD*=1.21). Teachers ranked the main benefits to students as 1) students better able to critically evaluate knowledge (*M*=1.76, *SD*=1.10); 2) students better able to identify and reflect on personal assumptions (*M*=2.57, *SD*=0.99); and 3) students better able to apply critical thinking skills across the IB courses (*M*=2.82, *SD*=1.17). The main challenges ranked by the teachers were 1) assessing student progress towards stated goals (*M*=3.56, *SD*=2.01); 2) identifying clear objectives (*M*=3.60, *SD*=2.07); and 3) critically evaluating student knowledge (*M*=3.61, *SD*=2.00). When asked to rate the effort required to successfully teach TOK in four key areas, teachers indicated assessing learning (mean effort of 7.47 (SD=2.09) required most effort, followed by planning (*M*=7.25, *SD*=2.53), providing feedback on learning (*M*=7.01, *SD*=2.34) and lastly, implementing lessons (*M*=6.17, *SD*=2.42). Teachers agree[18] that they are usually able to adjust assignments if students are having difficulty (*M*=3.09, *SD*=0.67).

Regarding the connection between TOK and the learner profile, teachers indicated[19] that they believe TOK coursework best aligns with the following attributes: 1) open-minded (66%), 2) thinkers (65%), and 3) inquirers (63%). Teachers agree that the TOK coursework helps students be successful in other DP subjects (mean agreement[20]= 3.30, *SD*=0.66).

T-test. The independent samples t-test was used to analyze significant differences between US schools and non-US schools on challenges and successes teaching TOK. The item with the lowest mean rank score for "main challenges experienced when teaching TOK", indicating the highest overall rank, was "assessing student progress towards goals". The difference in mean scores for "assessing student

[18] Using a 4 point agreement scale with 1 indicating strongly disagree and 4 indicating strongly agree
[19] Participants were asked to select all of the attributes of the learner profile that TOK aligns, therefore each attribute percentage is calculated out of 100%. Attributes with more than 50% support are highlighted here.
[20] Using a 4 point agreement scale with 1 indicating strongly disagree and 4 indicating strongly agree

progress towards goals" for US schools and non-US schools was not statistically significant (t (713) = -1.065, p = .287). The item with the lowest mean rank score for "most impact the success of the TOK course", indicating the highest overall rank, was "Teacher Interest". The difference in mean scores for "Teacher Interest" for US schools and non-US schools was not statistically significant (t (724) = 1.953, p = .051).

ANOVA. Analysis of Variance (ANOVA) tests the significance of group differences between two or more means while evaluating the inter-and intra-variation of each group. Post hoc tests are used to determine which groups are significantly different. Performing multiple ANOVAs on the same data can increase the Type I error, so it is important to identify post hoc procedures that can account for this. However, it is also important to not over correct and commit a Type II error. Especially, in research such as this, focused on patterns with practical significance as opposed to statistical significance. Tukey post hoc testing was used because it can mitigate the risk of an increase in Type I error and still maintain power with large sample sizes (Dunlap & Greer, 1996). Differences are being examined not to focus on statistically significant differences, but to identify the broad view to inform discussion and reflection surrounding teacher practice. Therefore, more flexibility in the interpretation and discussion of the ANOVA results is expected. Prior to conducting ANOVA, the data was evaluated to determine if it meets the necessary assumptions. With the exception of normality, the data meets the necessary assumptions (independence, outliers, and homogeneity of variances[21]). Normality was evaluated and it was determined statistically significant, but with trivial departures[22]. The highest ranked items for challenges and success enablers were evaluated for differences regarding years teaching and class size as previous research suggests differences may exist in these areas (Falk, 2013; Chingos, 2012).

The item with the lowest mean rank score for "main challenges experienced when teaching TOK", indicating the highest overall rank, was "assessing student progress towards goals". Scores for "assessing student progress towards goals" did not differ significantly across class size group, F (2, 709) = .912, p = .402. Scores for "assessing student progress towards goals" also did not differ significantly across years of teaching experience, F (2, 708) = .972, p = .379.

[21] Levene's Test was not significant for each analysis

[22] Given the large sample size (allaying concerns over normality because with large samples nonnormality can be more easily detected, but often trivial) and the results of the QQ-plot it was determined nonnormality was trivial. The QQ-plot produced nearly a 45 degree line.

The item with the lowest mean rank score for "most impact the success of the TOK course", indicating the highest overall rank, was "Teacher Interest". Scores for "most impact the success of the TOK course" did not differ significantly across class size group, F (2, 719) = 1.963, p = .141. Scores for "most impact the success of the TOK course" did differ significantly across years teaching the TOK, F (2, 720) = 3.160, p = .043. But, the post hoc analysis did not produce significant pairwise comparisons. The Tukey post hoc is more conservative as it tends to underestimate statistical significance in the pairwise tests.

Qualitative results. The analysis of the focus group transcripts and open ended survey items resulted in numerous codes that were condensed into themes that illuminated a range of teacher perspectives regarding Research Questions 1, 2, and 3. These are summarized below, with full results of the qualitative analysis for each individual survey items provided in the appendix (see Appendix C).

Survey open-ended responses. Regarding the purpose of TOK, the qualitative analysis of the survey items suggests that in addition to the options provided on the survey teachers felt that the purpose was to develop "critical thinking" and "international mindedness". Clusters of participant responses regarding "not judging others" and "challenge egocentric thinking" could be interpreted as separate purposes or included in "international mindedness" because they are aspects of the IB interpretation of "international mindedness". When describing the main benefits of TOK to students, 44 respondents selected "other". In their open-ended responses to this question, "Critical thinking" and "improve writing/communication" were other benefits most commonly proposed by survey participants.

Responses describing how the TOK course contributes to success in the areas of 1) other DP subjects, 2) Extended Essay (EE), 3) University Success, and 4) International citizenship/life skills highlighted the following areas: critical thinking, connect to content, evaluate sources, improving writing and communication, and not judging others (Table 5). It seems with the EE category, more "does not [contribute to the success]" codes were identified, possibly because in some situations the EE is completed before TOK (as suggested by one participant).

Table 5
Frequency of responses describing TOK contributions to other areas

Code	Frequency

Other DP Subjects	
critical thinking	441
connect to content	439
international mindedness	170
improve writing and communication	116
Extended Essay	
critical thinking	154
evaluate sources	124
use evidence	120
improve writing and communication	98
University Success	
critical thinking	226
improve writing and communication	63
evaluate sources	58
use evidence	35
International citizenship/life skills	
international mindedness	173
not judge others	170
critical thinking	81
knowledge is different for everyone	47

Focus groups. To address research questions 1-3, participants responded to questions about perceptions of TOK, benefits to students, challenges, and impact on student learning. The coding of the focus groups resulted in over 300 unique codes. The focus group transcripts were coded in entirety and the resulting codes were organized by research question. Then the codes were organized into larger themes. The most frequent codes and their larger themes related to perceptions of TOK are displayed in Table 6 together with quotes chosen to illustrate each theme.

Table 6
Themes and codes related to perceptions of TOK

Theme	Codes	Illustrative quotes
Connections	connects to other subjects, connect to content, real world connections, TOK is everywhere, inclusive	"I think the focus that we have on making connections in theory of knowledge - once students begin to make those connections between areas of knowledge and ways of knowing, that bell can't be unrung. So forever they're making those connections. So I think that's the effect on the kids. I think it serves the world. I think it serves humanity."

Critical thinking	Analyze, devil's advocate, critically evaluate, critical thinking, learn to handle controversy	". . .they notice some things that they would never notice before." "Simple things, like if you read one article about Barack Obama or whatever, [students] don't just sort of swallow it all, they try to do more research and see what other people in other countries are saying about the same thing."
Teacher passion ignites student passion	students value TOK, teacher passion contagious,	"You can't sit inactive through a class like this; I mean we can see that ourselves when we're going through it. The kind of discussions I think you get going, are actually quite challenging, I mean we find it challenging." "Yeah the passion that you transmit to your students, this is very important."
Life changing course	Appreciative, life changing	"I have been hearing more and more now that - we've been a diploma school for seven years. I've been hearing more and more from students post-four-year college and into graduate school who will email even then and say it's changing my life in graduate school, I still am remembering, in graduate school, the sorts of thinking that we did in high school, junior and senior year."
College preparation	college preparation, preparation, university skills	"I'll just say it's a great course, and when I see our graduates, when they come back to visit, other than my daughter, they talk about how TOK plays so well into what they're doing as undergraduates. So that's great. A lot of that is testament to the teacher, but also, I think, to the course being an excellent course."

Learner profile	open-minded, reflective, learn to handle controversy/principled/multiple viewpoints	"Exactly, I think that the biggest benefit is broadening the mind, of both the teacher and the students." "For me, a student benefit that I see kind of goes back to a couple of traits on the learner profile, and that is they are more reflective learners, which I think is kind of the same from their education up until this point, and also more open, because they are more comfortable sharing their ideas but listening to others' ideas and processing those before they react and respond."

The themes of "connections" and "critical thinking" are comprised of 10 codes that were referenced over 100 times. These two ideas emerged as primary descriptors of TOK. Participants described the critical thinking aspects of TOK, specifically the perceived benefits to students. Participants described their students as capable of viewing sensitive issues from multiple perspectives and being comfortable with disagreement. The participants described the TOK experience as "being everywhere", meaning that the applications of the skills gained in TOK extend to other subjects, real life, university, and beyond. It was further explained, TOK students don't see the world the same way after TOK. They question things previously taken at face value. Interestingly, some respondents explained that TOK becomes a verb in their school, "you have been TOKed", referring to the awakening of thought and perspective TOK students bring to each situation. Numerous mentions of frequent, albeit delayed, student praise of TOK were discussed. The passion surrounding TOK was evident, the 1st year teachers and the veterans excitedly discussed the positive outcomes for students gained from participating in TOK.

Research questions 4-6: impact on pedagogical beliefs, intentions, and practices; self-efficacy; professional development; reasons for teaching TOK

Research questions 4, 5, and 6 explored the impact of teaching TOK on teachers. Specifically, these questions looked at the influence of TOK on pedagogy, confidence, professional development, and enjoyment. Descriptive statistics, independent samples t-tests, and ANOVA were used to explore The

TOK Survey results. Qualitative coding was used to interpret the focus group results and open ended survey items.

Descriptive statistics. Complete descriptive statistics for each survey item are available in the appendix (see Appendix A). Survey A items 23, 27, 31-43[23] address the impact of TOK on teachers. Only 13% of teachers indicated that they did not choose to teach the TOK course. Teachers strongly agreed that teaching TOK has been a valuable professional development experience for them (mean agreement[24]= 3.72, *SD*=0.62). Specifically, they indicated[25] it 1) enhanced their own critical thinking (60%) and 2) developed their interdisciplinary understanding (52.5%). Teacher confidence teaching TOK was analyzed by examining mean confidence ratings on 11 Likert style items (the CTT scale items) in addition to the scale analysis using these items presented below. The item with the highest[26] mean (*M*=3.60, *SD*=0.66) was:

> ….in exploring knowledge questions related to ethics, such as: 'Is there such a thing as moral knowledge? Does the rightness or wrongness of an action depend on the situation? Are all moral opinions equally valid? Is there such a thing as a moral fact?

The results for the top three highest means were close. The second (*M*=3.59, *SD*=0.62) highest mean was for the following:

> ….in exploring knowledge questions related to human sciences, such as: "To what extent are the human sciences reliable? Can human behaviour be subject to laws in the same was as the material world? What constitutes good evidence in the human sciences?"

The third highest mean (*M*=3.59, *SD*=0.66) was for the following:

> ….in exploring knowledge questions related to history, such as: "What is unique about the methodology of history? Is eyewitness testimony a reliable source of evidence? How do we decide which events are historically significant?"

The item with the lowest mean (*M*=2.73, *SD*=1.05) confidence score was:

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[23] Appendix A Pg 54-56
[24] Using a 4 point agreement scale with 1 indicating strongly disagree and 4 indicating strongly agree
[25] Participants were asked to select all that apply from a list of possible benefits, therefore each outcome percentage is calculated out of 100%. Outcomes with more than 50% support are highlighted here.
[26] Using a 4 point agreement scale with 1 indicating not confident and 4 indicating very confident

….in exploring knowledge questions related to indigenous knowledge systems, such as: "In what ways are sense perception and memory crucial in constructing knowledge in indigenous knowledge systems? How do beliefs about the physical and metaphysical world influence the pursuit of knowledge in indigenous knowledge systems? How do indigenous people use the concept of respect to relate to their view of the world?"

T-test. The independent samples t-test was used to analyze significant differences between US schools and non-US schools on the CTT scale. The difference in mean CTT scores for US schools and non-US schools were not statistically significant (t (670) = 1.889, p = .060).

ANOVA. Scores on the CTT scale did not differ significantly across class size group, F (2, 666) = 2.02, p = .118. Scores on the CTT did differ significantly across years teaching the TOK, F (2, 665) = 16.48, p = .00 (Table 7).

Table 7

Descriptives for "years teaching TOK" for the Confidence Teaching TOK (CTT) score

					95% Confidence Interval for Mean	
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
1-3 years	289	3.17	0.47	0.03	3.12	3.22
4-9 years	274	3.35	0.42	0.03	3.30	3.40
10+ years	105	3.40	0.40	0.04	3.32	3.48
Total	668	3.28	0.45	0.02	3.25	3.31

Not surprising, the respondents with more years teaching the TOK have higher general TOK teaching confidence scores. Generally, teachers with 1-3 years of experience are considered early career teachers (See NCTQ, 2015). Tukey post-hoc comparisons (Table 8) of the 3 groups indicate that the "10 years or more experience teaching TOK" group (M =3.40, 95% CI [3.32, 3.48]) scored significantly higher than the "1-3 years experience" group (M = 3.17, 95% CI [3.12, 3.22]), p< .001. The "4-9 years experience" group (M =3.35, 95% CI [3.30, 3.40]) also scored significantly higher than the "1-3 years experience" group (p<.001). The mean confidence scores increase as years teaching experience

increases, but the post-hoc analysis only suggests a statistically significant difference between the two more experienced groups when each are compared to the least experienced group. The "10 years or more experience teaching TOK" group scored higher than the "4-9 years experience" group, but the difference was not statistically significant. Therefore, a linear contrast analysis (test of linear trends) was performed for the mean scores by years teaching to determine if statistical differences between each experience group existed. Linear contrast analysis can be applied to determine statistically significant differences between means associated with groups that follow a linear trend. The test for linear trends indicates a statistically significant positive relationship between experience and confidence, $t(214.17) = 4.80$, $p < .001$ (Appendix E).

Table 8

Tukey post-hoc comparisons of "years teaching TOK" for the CTT scale

		Mean			95% Confidence Interval	
(I) Q13_3cats	(J) Q13_3cats	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
1-3 years	4-9 years	-0.18*	0.040	.000	-.2688	-.0942
	10+ years	-0.23*	0.050	.000	-.3478	-.1118
4-9 years	1-3 years	0.18*	0.040	.000	.0942	.2688
	10+ years	-0.45	0.051	.606	-.1671	.0705
10+ years	1-3 years	0.23*	0.050	.000	.1118	.3478
	4-9 years	0.05	0.051	.606	-.0705	.1671

*. The mean difference is significant at the 0.05 level.

Qualitative results. The analysis of the focus group transcripts and open-ended survey items resulted in numerous codes that were condensed into themes.

***Survey open-ended responses*.** Survey items asking about teaching philosophy and professional development gained by teaching TOK were analyzed qualitatively. Responses for teaching philosophy included multiple descriptions within 1 survey response, resulting in 1,629 individual descriptions of teaching philosophy. The wording of the question requested teachers provide phrases or terms to describe their teaching philosophy. The phrases/terms were analyzed using word frequency to provide an illustrative picture of teaching philosophy (Figure 1). Teacher responses included phrases that were easily interpreted, "discussion based", "reflective listening practices", "relational", "engaging", "high expectations", "always room for improvement", "all students learn differently", "encouraging exploration", and "teach through activity not lecture". Responses also included phrases that were more

challenging to interpret such as “No failure - just a new learning experience”. The responses were coded. Some phrases could be coded as more than one category. For example, phrases such as “recognizing alternative views” and “devil’s advocate” and “often the obvious is wrong” were coded as both ‘open’ and ‘questioning’. The most frequent descriptors of teaching philosophy were: discussion based, student-focused, reflective, connections/ grounded in real life situations, exploration, collaborative, challenging, questioning/ question assumptions, critical/analysis, open-minded, adaptive, student-led, current, open (exercising all points of view but with valid arguments), flexible.

Figure 1. Word frequency display of the codes for teaching philosophy.

Teacher opened responses describing “other” types of professional development gained by teaching TOK included: critical thinking, international mindedness, student centered philosophy, not judge others, and connect to content. The responses describing critical thinking were self-explanatory, “I am a better critical thinker.” The responses describing student centered philosophy were also self-explanatory, “TOK has definitely brought my teaching to an even more student-centered approach” as were responses describing not judging others and connecting to the content. However, descriptions of professional development related to international mindedness were less direct. One participant

articulated the deepening of their international mindedness through teaching TOK in the following way, "[TOK gave me] a greater appreciation of the cultural influences in the gaining of knowledge."

***Focus groups*.** To address research questions 4-6, participants were asked in the focus groups to share their thoughts about the impact of TOK on teachers and the impact of teaching methods and efficacy on the success of TOK. The most frequent codes and their larger themes related to perceptions of TOK are displayed in Table 9. The theme of 'improves teaching' includes teachers' thoughts on ways they have developed their pedagogical approach and understanding. The theme of 'methods' refers to the explicit instructional strategies gained. And, the theme 'collaboration' refers to the strategies for working with colleagues developed.

Table 9
Themes and codes related to impact on teachers

Theme	Codes	Illustrative quotes
Improves teaching	improves teacher understanding; improves teaching pedagogy	"I think the TOK also develops the pedagogy of teaching. I know how much I have grown when it comes to the methods that I use during classes. I graduated from psychology, I did a PhD in psychology. So I thought that I knew quite a lot about how to I don't know, work with the group and what methods should I use. But then I discovered so many things, when I started working with the IB, and when I started to immerse myself in to the IB philosophy. I discovered that they are thinking routines, so a structured way of inquiry."
Methods	student centered philosophy; teach skills explicitly; texts to support; use TOK methods in other teaching; connections; discussion based	"(TOK) is an opportunity to be reflective of what (students are) learning and oftentimes students view their subject areas as discrete and what happens in their math class doesn't necessarily have an impact on what happens in their biology class, and so this is an opportunity to make cross-curriculum connections and get

		them reflecting on knowledge itself and also the fundamental underpinnings of what constitutes knowledge and what it's all about.
Collaboration	collaboration in development of materials and activities; guest lecturers; guest speakers; share expertise; partnerships; team teaching	"I think that it's fun actually to sit in groups. . .where we're actually trying to develop ideas together and see it from different perspectives."

Participants also discussed in the focus groups the "significant", but "meaningful" workload demanded by TOK compared to other courses. However, the participants often noted that the workload decreased after the first year and has significantly improved with the introduction of the current manual. As suggested by the participants, although the workload associated with TOK was high, is was nonetheless considered meaningful because the approaches developed for teaching TOK extend into other courses. Participants excitedly discussed the improvements in their own understanding of knowledge and pedagogy gained by teaching TOK. For example, one focus group participant stated the following,

> I think (TOK) does take you out of your comfort zone. My experience is that it did change my way of teaching. I taught primarily in the sciences and (TOK) took me away from focusing on the facts and more onto the concepts. My students' academic results improved significantly, on average by at least a grade. It was quite noticeable that that was a consistent, ongoing improvement because the discussion was removed from talking about the facts and more to the issues and the ethical concepts. I challenged students more in class to think and to challenge each other about the way they thought about biology and why things work the way they do.

Overwhelmingly, participants described TOK as helping them develop a student centered approach that relies on connections to content, discussions, and analyzing current world events. Additionally, participants discussed TOK making them aware of the benefits of collaboration. Because many TOK teachers explained they felt they did not have the content background they perceived as necessary to address TOK properly they learned to capitalize on the strengths of their colleagues. Many participants discussed collaborating with teachers across content areas to provide comprehensive content coverage to TOK. Often this included inviting colleagues into their TOK class a "guest teacher". The teachers

explained that in other courses they could "shut their doors and teach [in isolation]", but TOK made they aware of the benefits to collaboration.

Research questions 7-10: implementation; preparing students for assessments; collaboration; views on changes to TOK

Research questions 7-10 explored the TOK implementation process. Descriptive statistics were used to explore The TOK Survey results. Qualitative coding was used to interpret the focus group results and open ended survey items.

Descriptive statistics. Complete descriptive statistics for each survey item are available in the appendix (see Appendix A). Survey A items 28-30, 44[27], and Survey B items 11-22 address implementation. Teachers agreed[28] that recent changes to the TOK improve the TOK course (Table 10). Additionally, 73% of DP coordinators indicated that they were aware of the changes to TOK.

Table 10
Descriptive statistics for recent changes to TOK

Item	Total	Mean[29]	SD
28. Recent changes to the ways of knowing (WOKs) improve the TOK course	695	3.32	0.86
29. Recent changes to the areas of knowledge (AOKs) improve the TOK course	692	3.28	0.86
30. Recent changes to the Knowledge Framework improve the TOK course	692	3.31	0.81

TOK teachers were asked[30] how they collaborate with non TOK teachers (Table 11). Interestingly, of the collaboration options provided none were selected by more than 50% of the participants. Analysis of the open-ended comments given by respondents regarding collaboration is presented in the qualitative section below.

Table 11

[27] Appendix A Pg 54-57
[28] Using a 4 point agreement scale with 1 indicating strongly disagree and 4 indicating strongly agree
[29] Please note that in light of current debate surrounding the treatment of Likert items as continuous variables the means presented should be interpreted with caution. It is suggested (see Jamieson, 2004) because Likert item scales are ordered categories the intervals between the scale values are not equal. Therefore, numerical calculations, such as mean, are not valid. However, others suggest that using Likert scale items in parametric tests is acceptable in certain situations (see Lubke & Muthen, 2004).
[30] Participants were asked to "select all that apply" from a list, therefore each row percentage is independent and calculated out of 100%.

Collaboration activities			
	Frequency	Percent	Total
coordinate teaching so that topics align	225	23.4	960
coordinate assignments so that student work overlaps between courses	141	14.7	960
coordinate assignments so that deadlines are manageable for students	417	43.4	960
other _____	223	3.2	960

Survey questions concerning how the theory of knowledge course is implemented in IB World schools were included in Survey B items for DP coordinators. Several Survey B items addressed how TOK teachers are prepared and, specifically, the types of support and information they receive. Based on responses from the DP coordinators, TOK teachers receive unique training (84%) and unique information (89%). Typically, unique training and information refers to IBO workshops and guides specific to TOK. Of the coordinators that reported teachers receive unique support prior to teaching TOK (48%), the most common type of support received was additional materials (69%) followed by planning time (36%). When asked about the planning time that teachers are given, coordinators most frequently indicated (74%) planning time was provided during the day. Of those coordinators that indicated TOK implementation was different than other IB programme aspects (58%), most cited that teacher support (63%) and time (61%) were different than other IB programme aspects. Interestingly, DP coordinators agreed[31] more strongly that DP coordinators played a critical role in implementation (*M*=3.22, *SD*= 0.74) compared to the role they perceived school heads to play (*M*=2.56, *SD*= 0.87).

Qualitative results. The analysis of the focus group transcripts and open ended survey items resulted in numerous codes that were condensed into themes.

Survey open-ended responses. On the teacher survey, respondents were provided the opportunity to identify "other" main challenges in addition to seven items presented on the survey. A total of 73 individuals described an assortment of challenges of which "Assessment issues", "time" and "differentiating" were the most frequent codes. Associated comments provided by participants included frustration with scoring, "the only thing I have difficulties with is scoring the assessments. I do

[31] Using a 4 point agreement scale with 1 indicating strongly disagree and 4 indicating strongly agree

not believe that TOK training provides enough direct instruction on that, nor does there seem to be consistency when I look at the scores of my students" and frustration with evaluating progress, "Critically evaluating student knowledge is a challenge because students' thinking can be at many different stages within even a small group of students. I am historically an English Language Arts teacher, and the evaluation of students' writing within TOK is quite different than evaluation of students' writing in a traditional ELA setting". One response articulated the struggle with differentiating as it related to assessment,

> Differentiation [is the biggest challenge]. Some students are already brilliant thinkers whilst some are very narrow-minded, concrete thinkers. Both can progress but at different paces and in different ways, I find this a challenge and extremely interesting from a pedagogical point of view, how to measure this progress and how to provide for both types of learners.

As illustrated in another response, time issues are often related to the challenges of assessing and differentiating within TOK, "having the time to grade/evaluate/give feedback on all of the writing/presentations/projects that give me concrete evidence of their thinking [is the biggest challenge]".

Assessment issues was also the most frequent code in the open-ended "other" category when teachers explained why they did not enjoy teaching TOK. However, it should be noted that even though this was the most frequent code for "other" it was only coded 8 times as only 22 (2.3%) respondents indicated "no" they don't enjoy teaching TOK.

Focus groups. To address research question 3, participants responded to questions about the challenges with teaching TOK and enablers of successful TOK teaching. The most frequent codes and their larger themes related to implementation are displayed in Table 12.

Table 12
Themes and codes related to impact on teachers

Theme	Codes	Illustrative quotes
Administrative challenges	Class size, class timing, summer assignments	"But also it's connected also with small things, like moving it in to the morning and the schedule, so that it will - for example this year. I had lessons from 10 to 11:30 and it's the

		perfect time for having TOK. But we needed to fight really hard to have it somewhere during the day…" "That tells a lot about the attitudes to the students as well, if it's always Friday afternoon five o'clock when you do TOK."
Assessment challenges	grading difficult limited activities to grade, limited external accountability, grading is hard because not one right answer; students want numeric grade	"Because they want to have grades, because they need to know how they are doing. With the feedback, even if it's an extended feedback, they don't really know how they are doing, they want the number." "So I want them to be able to come to class with an open mind and not stress like what is she going to give us today to do. So assessing is more difficult than with English, that we have test weeks and certain internal assessment things that they have to complete."
Teacher background	challenging for teachers because of content background, benefit to have choice in content, understanding of the IB DP required	"I think that's one of the things that teachers who have tried TOK for a long time find so exciting about it is that you have to be reading in these other subjects, and I think it's also time-consuming is that if you're going to do a good job of it, you're going to have to read and teach yourself the stuff in these other subjects."

Overwhelmingly, the participants explained that the school sends the message about the importance of TOK. Two types of messaging were discussed frequently: 1) time of day the course is offered and 2) grading. The time of day was brought up because participants argued that when the course is offered after school it undermines the academic importance. Some participants articulated that the TOK has an "add on" mentality because it is offered as an extra class period, extending the school day for TOK

students. Others, explained that it is treated the same as other DP courses and taught during the school day. TOK doesn't receive the same type of score as the other course components of the IB Diploma Programme. In the other courses students earn a score on an external exam[32]. But, TOK students are assessed through an oral presentation, assessed internally, and 1,600 word essay, assessed externally. Variations on how the individual school treats the oral presentation can also result in different messages about importance of TOK. Additionally, participants shared that assessments can be problematic because of a lack of clarity regarding scoring. As suggested by several participants, this lack of clarity about scoring is due to the nature of the TOK course. It is a course focused on examining knowledge from multiple perspectives, not necessarily about identifying a single right answer. The participants explained that this type of activity is more challenging to grade. The identification of 'teacher background' as a challenge is interesting because generally the teachers indicated overcoming it without external assistance. It seems the teachers perceive a TOK teacher should have a certain background, but the focus groups suggest that the perception of "required" background differs among participants. Essentially, each teacher felt others had better qualifications than they did. But, through collaboration the teachers addressed the TOK content comprehensively.

Discussion

The findings from this research aim to offer insights into the perceptions, impact, and implementation of the IBDP's TOK course that could not only assist IB internally, but also contribute to the research on teaching perspectives in the larger educational community. The discussion section is organized by research question category. Research questions were organized into three categories: perceptions of TOK, teacher impact, and TOK implementation.

Perceptions of TOK

Purpose and benefits. The purposes of TOK identified by study participants align with identified student benefits. The perception of the purpose and benefits of TOK include evaluation of knowledge, critical thinking, building connections, and examining personal assumptions. It isn't surprising that a course titled, Theory of *Knowledge*, aims to deepen awareness of how knowledge is constructed and empower students to critically evaluate knowledge. But, what is interesting is the focus on student

[32] The IBO uses a combination of internal and external assessments to evaluate student understanding in the DP courses. External assessments form the basis of the assessment for most courses because of their high levels of objectivity and reliability. However, most courses also include teacher assessments.

reflection of personal and ideological assumptions. The survey and the focus group responses both addressed the power of TOK to awaken students to multiple perspectives. Consistently TOK was described as developing learners who don't judge others and who critically evaluate evidence before forming opinions. The TOK experience was described as enabling students to question and challenge the world around them, while being comfortable with disagreement. These constructs underpin the development of socially responsible young people. Handling disagreement and being comfortable with disagreement are arguably two essential aspects of participatory citizenship (Huckfeldt, Johnson, & Sprague, 2004). As a part of the IB mission to develop "responsible members of local, national and global communities" (IBO, 2008) this skill will enable students to comfortably discuss divergent views as opposed to dismissing or avoiding disagreements. As noted by Huckfeldt, Johnson, & Sprague (2004) avoiding disagreements could end communication and slow progress. Appropriately, the aspect of the IB Learner Profile identified as best aligned with TOK was open-minded.

Challenges. Assessment was clearly identified as a challenge. The teachers discussed difficulty grading or scoring something they perceived as subjective. The oral presentation was especially challenging for the teachers to score. Additionally, teachers explained that it was challenging because students want more scored activities with concrete feedback, but without "right" and "wrong" answers in TOK it is challenging to provide this type of feedback. The top three challenges identified on the survey are all assessment related: 1) assessing progress towards a goal, 2) identifying objectives, and 3) critically evaluating student knowledge. Participants were asked to rank effort associated with aspects of teaching TOK; assessing learning required more effort than planning and implementing instruction. It was suggested that because the teachers and students are familiar with other aspects of the DP that are very explicit about assessment the expectation for TOK is that it would have the same level of explicitness, but based on the focus group data the course materials don't appear to communicate that to the teachers. Two resources were discussed by the TOK teachers: 1) Theory of knowledge guide (IBO, 2013) and 2) Theory of knowledge teacher support materials (IBO, 2015c). After reviewing these resources it is evident the IBO provides guidance on assessment in TOK. So, the challenge with assessment appears to be in implementation. The Theory of knowledge guide (IBO, 2013) dedicates 9 pages to assessment in TOK. The guide outlines assessment practices in all DP courses (formative and summative types), expectations for the two assessment tasks in TOK (the externally marked essay and the internally marked oral presentation[33]), and provides rubrics for each assessment task (referred to as

[33] Marks awarded by teachers for the presentation will be subject to moderation procedures.

assessment instruments). The Theory of knowledge teacher support materials (IBO, 2015c) include two sections dedicated to assessment: 1) a guide to TOK assessment and 2) assessed samples of the student work. The guide to TOK assessment includes possible formative assessments aligned to teaching objectives. For example, for the objective "Understanding shared knowledge has links to personal knowledge", a suggested formative assessment is to "prepare a presentation outline using the presentation diagram applying this to a real-life situation" and then suggested feedback to the students is "self-assessment using the presentation marking descriptors". The assessed samples of student work section includes samples of the student work (essay and presentation) with examiner marks and comments. It appears the IBO has provided guidance on the types of assessment expected and how to successfully prepare students for the summative assessments using formative activities. Relying on the evidence from the focus groups and surveys suggest that teachers are not clear on how to articulate measurable objectives and measure student progress (Popham, 2003). Many assessments in the larger educational community rely on students to demonstrate covert knowledge in an overt measurable manner. But, it seems that the TOK teachers feel they are not given sufficient resources to measure the covert topics addressed in TOK.

Success. One very promising outcome was that the vast majority of teachers in this sample indicated that they enjoy teaching the TOK course (86.5%). The teachers also indicated that teacher interest was the most important contributor to the success of the TOK course. This suggests that that the majority of teachers have a strong interest in teaching TOK and feel that they are directly responsible for making the course a success. Therefore, if teachers believe they are the most important contributors to a successful TOK course then they can be important contributors to the success of the TOK course. This is very powerful because research suggests that self-fulfilling prophecies in education are common. As established by Rosenthal and Jacobson (1968) reality can be positively influenced by expectations. Often this is applied to the relationship between students and teachers, but could be extended to the relationship between teachers expectations of themselves and their own teaching outcomes.

Impact on teachers

It is evident from the surveys and focus groups that teaching TOK serves as valuable professional development (PD) for the teachers. Specifically, teachers describe similar gains to students: seeing things from multiple viewpoints, being open, not judging others. Teaching TOK seems to strengthen teaching approaches not only used in TOK, but also in other courses. Teachers described student

centered, reflective, interdisciplinary, real world lessons as an essential part of their TOK teaching approach. Overwhelmingly, teachers felt confident in their abilities to successfully teach TOK. Not surprisingly, confidence teaching TOK improved with years experience teaching TOK. This aligns with findings from other studies examining teaching confidence and teaching self-efficacy (see Klassen & Chiu, 2010). As a focus group participant explained,

> I think the TOK also develops the pedagogy of the teaching. I know how much I have grown when it comes to the methods that I use during classes. Even comparing [to my experience] - I did a PhD in psychology. So, I thought that I knew quite a lot about how to work with the group and what methods I should use. But, then I discovered so many things, when I started working with the IB, and when I started to immerse myself into the IB philosophy. I discovered that they are thinking routines, so a structured way of inquiry.

TOK teachers with more years of TOK teaching experience have higher confidence scores. This suggests that as teachers continue to teach TOK they will become more confident. Teacher confidence has been associated with positive outcomes for students (Hudson, Kloosterman, & Galindo, 2012; Munby, Russell, & Martin, 2001). It is anticipated the positive outcomes for students identified in the extant literature would extend to TOK students.

TOK implementation.

The implementation successes and challenges were identified using data from the teacher survey and the coordinator survey as well as focus group transcripts. Interestingly, survey items were examined to see if differences existed across regions and no differences across regions were identified, suggesting that TOK is implemented and perceived similarly regardless of school location.

Teacher background. One challenge of implementation that was uniquely described as both "a challenge" and "solved" problem was a teacher's subject area expertise. Many of the teachers discussed that it was challenging to teach TOK because they felt they didn't have the content background necessary. However, the same teachers discussed the joys of collaborating with colleagues and learning new content. Teachers explained that they often invited colleagues to be guest teachers or team teachers when they needed support with the content. One participant offered the following related comment,

> I think this is a truly authentic collaborative learning and teaching experience. . . that also goes back to what [other participant] said, where if you're in a team teaching - like, I'm a science teacher but we have a language teacher, music teacher as part of the team. It cuts back on you having to do the research and trying to understand other subjects.

Because the majority (76%) of coordinators indicated that teachers were not hired specifically to teach the TOK course it makes sense that they would be pulled from a variety of disciplines. Based on the survey responses it seems that the most common selection method for TOK teachers is to ask for volunteers. Only 13% of teachers indicated that they did not choose to teach TOK. While the topic of teacher background appears to be a challenge, it also appears to be a challenge the teachers enjoying solving as they eagerly volunteer to teach TOK.

Administrative challenges. The challenges surrounding TOK implementation involve class size, time of day, and workload. These are common challenges for many educators. The TOK teachers articulated that while class size and timing are issues in other courses, they are especially challenging for TOK because of the nature of the TOK course. With a large class size it is difficult to build the relationships with the students necessary for the reflective dissection of knowledge essential to teaching TOK. Additionally, accurately and frequently using formative assessment to gauge individual student progress is challenging in a large TOK class. While many techniques can be used in other content areas to quickly assess student understanding it is challenging to quickly assess student understanding of epistemology. The timing of the TOK course was discussed at length during the focus groups. It seems some schools schedule TOK after school, like an extracurricular activity, sending the message that TOK is not an equal component of the DP. It is not clear how frequently this scheduling strategy is used. However, it is a logical solution because TOK is classified as the IB DP "core" along with the Extended Essay (EE) and Creativity, Action, and Service (CAS). The EE and CAS objectives are not typically addressed in a single course during the day. Therefore, scheduling TOK outside of the school day would keep it consistent with CAS and EE. It seems the teachers would appreciate scheduling TOK in the same manner that subjects in groups 1-6 are scheduled.

Conclusion

This research was conducted in response to a Request for Proposals (RFP) solicited by the IBO. The initial RFP highlighted the need for research "investigating teacher views of TOK and to document school

implementation practices to inform the ongoing development of the Theory of Knowledge course." To most simply and directly answer this query we offer the following conclusions.

Teacher views. Teacher views of TOK are overwhelmingly positive. TOK teachers believe the TOK course is essential in developing students into global citizens, specifically enhancing their open-mindedness. And, also provides valuable professional development for teachers enabling them to deepen their own critical thinking, interdisciplinary knowledge, and student centered pedagogies. Teachers are confident teaching TOK and their confidence continues to improve with experience. Teachers are most confident addressing the ethical and moral aspects of TOK. Teachers are least confident addressing indigenous knowledge systems within TOK.

Implementation. Implementation is overall smooth. It appears staff teaching assignments work well, but the TOK teachers creatively design their own solutions. Many teachers might initially express concerns about their preparation to teach TOK, fearing they don't have the necessary content background knowledge. But, this fear does not appear to impact their confidence teaching TOK or their success teaching TOK. They devised solutions to overcoming this obstacle by collaborating with their colleagues (team teaching, rotational teaching, or guest teachers). Generally, teachers are not specifically hired to teach TOK, but are often assigned (or volunteer for) this responsibility in addition to the content they were hired to teach. This suggests there is not a universal content background for TOK teachers. This approach seems to cause initial hesitation, but no lasting negative impacts. The vast majority of teachers (86.5%) enjoy teaching TOK, and only a small minority (13%) indicated they did not choose to teach TOK. This would suggest that DP coordinators might be better served by asking for volunteers or hiring specifically for TOK as opposed to assigning teachers to teach TOK.

The most important implementation challenge remaining unsolved is assessment within the TOK. The materials provided by the IBO clearly address assessment (both formative and summative), but the teachers still struggle with measuring student progress. It appears the TOK teachers receive unique training, support, and materials provided by the school or the IBO. But, the materials and training don't enable them to develop helpful formative assessments that can assist in measuring student progress in critical thinking[34]. It seems many teachers struggle with identifying measurable objectives related to critical thinking and given that critical thinking is an essential aspect of TOK it would be helpful to provide support in this area. Perhaps, materials and training focused on creating measurable TOK

[34] The formative assessment guidance provided addresses preparation for the essay and presentation

objectives drawn from the course content could be offered. This support would need to expand on the existing assessment resources (that focus on preparing for the oral presentation and essay) and address the subjective nature of the TOK course content. Teachers would benefit from resources on measuring 1) critical thinking progress and 2) student understanding of sources of knowledge. As these are the skills that consume their class work and prepare them for the essay or oral presentation. Even with the concerns surrounding assessment, this research suggests the majority of TOK teachers greatly value the experience for themselves and their students.

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Appendix A

Survey with Response Descriptives

1. Do you have experience teaching the Theory of Knowledge (TOK) course?

Response	Frequency	Percent
No response	529	25.4
No	409	19.7
Yes	1141	54.9
Total	2079	100.0

2. Please identify your gender:

Response	Frequency	Percent
No response	544	26.2
Don't want to say	16	.8
Female	773	37.2
Male	745	35.8
Other	1	.0
Total	2079	100.0

3. How many years has your school offered the IB Diploma Programme?

Responses received: 1495

Average length: 11.2 years

Mode length: 5 years

4. What is your nationality?

Responses were received from individuals who identified 69 unique nationalities. The 20 most frequent nationalities are displayed below.

Nationality[35]	Frequency	Percent
US/United States American	1007.00	46.9%
UK/United Kingdom	318.00	14.8%

[35] Please note that when open responses were provided, such as country name or nationality, the most frequent spelling provided by the respondents is listed. For each responses numerous variations were provided (for example, China, PRC, and People's Republic of China).

Canadian	116.00	5.4%
Ecuadorian	98.00	4.6%
Indian	84.00	3.9%
Australian	69.00	3.2%
Spanish	40.00	1.9%
Mexican	32.00	1.5%
German	31.00	1.4%
Argentinian	29.00	1.4%
Colombian	26.00	1.2%
New Zealander	20.00	0.9%
Peruvian	18.00	0.8%
French	16.00	0.7%
Polish	16.00	0.7%
Swedish	15.00	0.7%
Turkish	15.00	0.7%
Chilean	12.00	0.6%
Singaporean	12.00	0.6%
Chinese	11.00	0.5%
Other	160.00	7.5%

5. In which country is your school located?

Responses were received from schools in 111 different countries. The 20 most frequent countries are listed below:

Country	Frequency	Percent
US	377.00	24.6%
Ecuador	104.00	6.8%
India	72.00	4.7%
Canada	68.00	4.4%
UK	54.00	3.5%
Australia	48.00	3.1%
China, People's Republic of	46.00	3.0%
Spain	46.00	3.0%
Germany	42.00	2.7%
Mexico	42.00	2.7%
Singapore	42.00	2.7%
Hong Kong	30.00	2.0%
United Arab Emirates	29.00	1.9%
Colombia	26.00	1.7%
Turkey	26.00	1.7%
Argentina	25.00	1.6%
Perú	25.00	1.6%
Switzerland	23.00	1.5%
Poland	20.00	1.3%
Thailand	20.00	1.3%
Other	369.00	24.1%

6. What is your first (or best) language?

Responses were received from participants indicating 40 unique "best" languages. The 20 most frequent languages are displayed below.

"Best" Language	Frequency	Percent
English	1036.00	66.1%
Spanish	281.00	17.9%
Spanish	39.00	2.5%
French	32.00	2.0%
German	28.00	1.8%
Polish	16.00	1.0%
Turkish	15.00	1.0%
Malay	12.00	0.8%
Swedish	12.00	0.8%
Chinese	9.00	0.6%
Dutch	8.00	0.5%
Arabic	6.00	0.4%
Catalán	6.00	0.4%
Bulgarian	5.00	0.3%
Greek	5.00	0.3%
Hindi	5.00	0.3%
Hungarian	5.00	0.3%
Finnish	4.00	0.3%
Italian	4.00	0.3%
Portuguese	4.00	0.3%
Other	36.00	2.3%

7. What is the highest degree or level of education you have completed?

Response	Frequency	Percent
No Response	545	26.2
bachelor's degree	413	19.9
master's degree	931	44.8
doctoral degree	145	7.0
other	45	2.2
Total	2079	100.0

8. Approximately how many students are in each TOK class offered at your school?

Response	Frequency	Percent
No Response	543	26.1

10-15	430	20.7
16-20	485	23.3
21-25	311	15.0
less than 10	112	5.4
more than 25	193	9.3
unsure	5	.2
Total	2079	100.0

9. How many TOK classes are offered at your school?

# of TOK classes	Frequency	Percent
No response	22	1.1
1.00	229	11.0
2.00	444	21.4
3.00	216	10.4
4.00	183	8.8
5.00	74	3.6
6.00	84	4.0
7.00	18	.9
8.00	57	2.7
9.00	14	.7
10.00	24	1.2
11.00	4	.2
12.00	26	1.3
13.00	4	.2
14.00	13	.6
15.00	6	.3
16.00	10	.5
17.00	2	.1
18.00	3	.1
19.00	1	.0
20.00	4	.2
22.00	1	.0
24.00	1	.0
25.00	2	.1
26.00	1	.0
36.00	3	.1
40.00	2	.1

41.00	1	.0
42.00	1	.0
50.00	4	.2
56.00	1	.0
60.00	2	.1
64.00	1	.0
70.00	3	.1
78.00	1	.0
80.00	3	.1
90.00	4	.2
99.00	11	.5

10. Which of the following best describes your primary role(s)?

Response	Frequency	Percent
No response	534	25.7
DP coordinator	585	28.1
Teacher	960	46.2
Total	2079	100.0

Note: Items 11-45 pertain to those with a primary role of "Teacher" who indicate experience teaching the TOK course.

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

Response	Frequency	Percent
No Response	109	11.4
1-3	40	4.2
4-6	69	7.2
7-9	98	10.2
10-12	123	12.8
More than 12	521	54.3
Total	960	100.0

12. How many years have you been teaching at an authorized International Baccalaureate (IB) school?

Response	Frequency	Percent
No Response	110	11.5
1-3	172	17.9
4-6	209	21.8
7-9	147	15.3
10-12	132	13.8
More than 12	190	19.8
Total	960	100.0

13. How many years have you been teaching the Theory of Knowledge (TOK) course?

Response	Frequency	Percent
No Response	112	11.7
1-3	384	40.0
4-6	219	22.8
7-9	124	12.9
10-12	57	5.9
More than 12	64	6.7
Total	960	100.0

14. Other than TOK, what are your teaching responsibilities?

Response	Frequency	Percent
No Response	108	11.3
I only teach TOK	56	5.8
non IB courses	281	29.3
other IB courses	515	53.6
Total	960	100.0

15. Do you enjoy teaching the TOK course? *If no, why not?[36]

Response	Frequency	Percent
No Response	108	11.3
No	22	2.3
Yes	830	86.5
Total	960	100.0

16. What do you see as the main purpose of TOK? (rank)

[36] Open ended items analyzed separately

	Frequency of Rank								
	1	2	3	4	5	6	Total	Mean [37]	SD
A.To develop an awareness of how knowledge is constructed, critically examined, and renewed by individuals and communities;	467	129	61	48	32	16	753	1.80	1.28
B.To encourage students to reflect on their experiences in school and everyday life;	61	164	204	190	112	16	747	3.24	1.24
C.To help students make connections between academic disciplines and between thoughts, feelings and actions;	84	221	211	158	63	9	746	2.90	1.18
D.To help students develop an awareness of personal and ideological assumptions;	95	169	194	213	67	7	745	3.01	1.21
E.To prepare students for further learning;	28	60	63	116	432	39	738	4.33	1.20
F.Other_____	14	4	5	5	12	84	124	5.01	1.73

17. What do you see as the main benefits to students of participation in TOK? (rank)

	Frequency of Rank							
	1	2	3	4	5	Total	Mean	SD
A.Students better able to critically evaluate knowledge.	439	147	83	57	21	747	1.76	1.10
B.Students better able to identify and reflect on personal assumptions.	115	237	254	128	10	744	2.57	0.99
C.Students better able to identify and reflect on ideological assumptions.	46	147	276	259	9	737	3.05	0.92
D.Students better able to apply critical thinking skills across the IB courses.	122	204	122	284	16	748	2.82	1.17

[37] Because 1 is the highest rank a low mean indicates a high value

E.Other_____	9	6	2	2	57	76	4.21	1.46

18. What do you see as the main challenges experienced when teaching TOK? (rank)

	Frequency of Rank										
	1	2	3	4	5	6	7	8	Total	Mean	SD
A.Critically evaluating student knowledge	130	129	123	99	85	75	71	10	722	3.61	2.00
B.Identifying and reflecting on personal assumptions	43	93	95	138	133	132	74	10	718	4.35	1.77
C.Identifying and reflecting on ideological assumptions	41	60	116	119	167	135	62	10	710	4.43	1.69
D.Making connections between the TOK content and content studied in other courses	82	67	64	119	94	90	164	28	708	4.61	2.12
E.Identifying clear objectives or benchmarks	156	110	105	93	88	91	53	19	715	3.60	2.07
F.Assessing student progress towards stated goals	114	178	112	64	84	86	70	7	715	3.56	2.01
G.Adjusting approach when needed so all learners are progressing	113	84	103	77	56	89	162	32	716	4.33	2.29
H.Other_____ _____	39	8	2	3	2	2	5	35	96	4.27	3.23

19. Please rate the effort required to successfully teach TOK on a scale of 1 (least effort) -10 (most effort) in the following areas:

	N	Mean	SD
A. Planning lessons	749	7.25	2.53
B. Implementing lessons	748	6.17	2.42
C. Assessing learning	749	7.47	2.09

D. Providing feedback on learning	741	7.01	2.34

20. Which of the following most impact the success of the TOK course in your school? (rank)

	Frequency of Rank											
	1	2	3	4	5	6	7	8	9	Total	Mean	SD
A.Teacher content knowledge gained from previous education	93	98	95	101	89	85	72	48	47	728	4.46	2.40
B.Teacher pedagogical approaches developed from previous education or non IB training	52	91	105	106	109	96	79	67	28	733	4.69	2.21
C.Teacher pedagogical approaches developed from IB training	70	83	119	111	103	88	69	46	37	726	4.50	2.24
D.Teacher interest in TOK	286	129	89	78	42	26	30	17	29	726	2.89	2.26
E.School wide support	36	50	72	62	90	96	72	128	96	702	5.72	2.41
F.Administrator/school head support	22	39	50	61	77	103	112	121	112	697	6.11	2.26
G.Class size	35	71	69	70	81	90	130	88	84	718	5.54	2.39
H.Student population	26	34	64	71	64	82	100	132	131	704	6.13	2.36
I.Student interest	113	136	89	75	78	55	49	60	64	719	4.27	2.61

21. In what ways does the TOK course contribute to success in the areas below?

A. Other DP subjects:_____
B. Extended essay:_____
C. University success: _____
D. International citizenship/life skills: _____

22. Which aspects of the IB Learner Profile do you think TOK best aligns? (select all that apply)

	Frequency	Percent[38]	Total
Inquirers	594	62.9	960
Knowledgeable	327	34.1	960
Thinkers	624	65.0	960
Communicators	405	42.2	960
Principled	203	21.1	960
Open-minded	634	66.0	960
Caring	178	18.5	960
Risk-takers	281	29.3	960
Balanced	311	32.4	960
Reflective	618	64.4	960

Please rate how much you personally agree or disagree with these statements. Use the following scale:

(1) strongly disagree

(2) disagree

(3) agree

(4) strongly agree

N/A

Item	Total	Mean[39]	SD
24. When a student is having difficulty with an assignment, I am usually able to adjust it to his/her level	698	3.09	0.67
25. The TOK course helps students to be successful in other DP subjects	695	3.30	0.66
26. When a student has difficulty succeeding in my TOK class, it is often more related to specific student characteristics (i.e., level of parental involvement, challenging behavior, or other exceptional learning needs) than it is to the effectiveness of the TOK curriculum.	693	2.89	0.89
27. Teaching TOK has been a valuable Professional Development experience	699	3.72	0.62
28. Recent changes to the ways of knowing (WOKs) improve the TOK course	695	3.32	0.86
29. Recent changes to the areas of knowledge (AOKs) improve the TOK course	692	3.28	0.86

[38] The percent column will not total 100% because it is percent who indicate each answer option aligns to TOK. With "select all that apply" item types frequency represents those who checked that item. Percent is the percent of those who believe that item aligns to TOK.

[39] Please note that in light of current debate surrounding the treatment of Likert items as continuous variables the means presented should be interpreted with caution. It is suggested (see Jamieson, 2004) because Likert item scales are ordered categories the intervals between the scale values are not equal. Therefore, numerical calculations, such as mean, are not valid. However, others suggest that using Likert scale items in parametric tests is acceptable in certain situations (see Lubke & Muthen, 2004).

30. Recent changes to the Knowledge Framework improve the TOK course	692	3.31	0.81

Please rate how confident you are in your ability to accomplish each of the following skills on a scale of 1-4 (4 = Very confident; 1 = Not Confident with NA).

Item	Total	Mean[40]	SD
31. ...engaging my students in a variety of learning activities that allow them to adequately explore areas of knowledge (AOKs).	666	3.45	0.61
32. ...using the "knowledge framework" (i.e., scope applications, concepts/language; methodology; historical development; links to personal knowledge) to help students deepen their understanding of areas of knowledge	667	2.96	0.77
33. ….choosing how each AOK is approached; deciding on examples to bring in according to the specific interests and needs of my students.	666	3.33	0.67
34. ... in exploring knowledge questions related to mathematics, such as: "Is there a distinction between truth and certainty in mathematics? Is mathematics independent of culture? Is mathematics discovered or invented?"	667	2.83	0.98
35. ...in exploring knowledge questions related to natural sciences, such as: "What does it mean for discipline to be a science? Is there just one scientific method? Should there be ethical constraints on the pursuit of scientific knowledge?"	661	3.32	0.77
36. ….in exploring knowledge questions related to human sciences, such as: "To what extent are the human sciences reliable? Can human behaviour be subject to laws in the same was as the material world? What constitutes good evidence in the human sciences?"	668	3.59	0.62
37. ….in exploring knowledge questions related to history, such as: "What is unique about the methodology of history? Is eyewitness testimony a reliable source of evidence? How do we decide which events are historically significant?"	664	3.59	0.66
38. ….in exploring knowledge questions related to the arts, such as: "How can the subjective viewpoint of an individual contribute to knowledge in the arts? On what basis can the merit of a work of art be judged? Is there any point in discussing the arts - should we not simply experience them?"	668	3.50	0.74
39. ….in exploring knowledge questions related to ethics, such as: "Is there such a thing as moral knowledge? Does the rightness or wrongness of an action depend on the situation? Are all	667	3.60	0.66

[40] Please note that in light of current debate surrounding the treatment of Likert items as continuous variables the means presented should be interpreted with caution. It is suggested (see Jamieson, 2004) because Likert item scales are ordered categories the intervals between the scale values are not equal. Therefore, numerical calculations, such as mean, are not valid. However, others suggest that using Likert scale items in parametric tests is acceptable in certain situations (see Lubke & Muthen, 2004).

	moral opinions equally valid? Is there such a thing as a moral fact?"			
40.	….in exploring knowledge questions related to religious knowledge systems, such as: "How do we decide between the competing claims of different religious knowledge systems? Can there ever be a basis for religious knowledge that is independent of the culture that produces it? Is atheism as much a matter of faith as religious belief?"	663	3.19	0.93
41.	….in exploring knowledge e questions related to indigenous knowledge systems, such as: "In what ways are sense perception and memory crucial in constructing knowledge in indigenous knowledge systems? How do beliefs about the physical and metaphysical world influence the pursuit of knowledge in indigenous knowledge systems? How do indigenous people use the concept of respect to relate to their view of the world?"	658	2.73	1.05

42. In which of the following ways has teaching the TOK provided professional development for you? (select all that apply)

	Frequency	Percent	Total
enhanced your critical thinking	576	60.0	960
enhanced development of my epistemological beliefs	391	40.7	960
enhanced/developed a teaching philosophy that includes:	83	8.6	960
learner centered approach	392	40.8	960
international thinking/global context	384	40.0	960
exploration of significant disciplinary content	385	40.1	960
the development of interdisciplinary understanding	504	52.5	960
other	40	4.2	960
none of the above	4	.4	960

43. Did you choose to teach the Theory of Knowledge Course? *if no, add question: Why do you believe you were assigned to teach this course? If yes, add question: Why did you choose to teach the TOK course?

	Frequency	Percent
No response	283	29.5
No	123	12.8
Yes	554	57.7
Total	960	100.0

44. In which of the following ways do you collaborate with non TOK teachers in your school regarding your TOK course (select all that apply):

	Frequency	Percent	Total
coordinate teaching so that topics align	225	23.4	960
coordinate assignments so that student work overlaps between courses	141	14.7	960
coordinate assignments so that deadlines are manageable for students	417	43.4	960
other _____	223	3.2	960

45. Thank you for your time. If you are willing to be contacted for follow up questions please provide your email address. _____ (optional)

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END SURVEY A (teachers)

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SURVEY B (n=585)

11. Prior to teaching the TOK course do teachers receive unique training regarding TOK teaching?

Response	Frequency	Percent
No response	26	4.4
No	65	11.1
Yes	494	84.4
Total	585	100.0

12. Prior to teaching the TOK course do teachers receive unique information regarding TOK?

Response	Frequency	Percent
No response	31	5.3
No	34	5.8
Yes	520	88.9
Total	585	100.0

13. Prior to teaching the TOK course do teachers receive unique support?

Response	Frequency	Percent
No response	42	7.2
No	260	44.4
Yes	283	48.4

Total	585	100.0

13a. Which the following unique supports do TOK teachers receive? (Select all that apply)

Response	Total	Frequency	Percent
Additional salary	283	23	.1
Additional planning time	283	103	36.4
Additional materials	283	196	69.2
Other_____	283	83	29.3

14. How much planning time for teaching TOK are teachers given?

15. When are TOK teachers given planning time?

Response	Total	Frequency	Percent
During the teaching day	585	433	74.0
Before school	585	58	9.9
After school	585	111	19.2
Other_____	585	107	18.3

16. Prior to taking or during the TOK course are students provided with unique information or support?

* If yes, add additional question:

16a. Which the following unique supports do TOK students receive?

A. Additional study time during the day
B. Additional school supplies
C. Increased parental communication
D. Other_____

Response	Frequency	Percent
No response	31	5.3
No	269	46.0
Yes	285	48.7
Total	585	100.0

Response	Total	Frequency	Percent
Additional study time during the day	585	75	12.8
Additional school supplies	585	118	20.2
Increased parental communication	585	81	13.8

Other_____	585	118	20.2

17. Does TOK implementation present different challenges than implementation of other aspects of the IB programme?

Response	Frequency	Percent
No response	52	8.9
No	192	32.8
Yes	341	58.3
Total	585	100.0

17a. In which of the following ways is TOK implementation different? (select all that apply)

Response	Total	Frequency	Percent
Teacher support	341	213	62.5
Time	341	208	61.0
Money	341	40	11.7
Teacher materials	341	157	46.0
Teacher hiring practices	341	93	27.3
Student support	341	144	42.2
Student materials	341	131	38.4

Please rate how much you personally agree or disagree with these statements. Use the following scale:

A. (1) strongly disagree
B. (2) disagree
C. (3) agree
D. (4) strongly agree

Item	Total	Mean	SD
18. The DP coordinator plays a critical role in implementation of the TOK course	535	3.22	0.74
19. The school head plays a critical role in implementation of the TOK course	530	2.56	0.87

20. Are teachers hired specifically to teach TOK?

Response	Frequency	Percent

No response	48	8.2
No	401	76.8
Yes	136	23.2
Total	585	100.0

21. What teacher qualifications are most important when hiring or assigning teachers for the TOK course?

22. Are you aware of recent changes to WOK, AOKs, and KF?

    a. No
    b. Yes * if yes add follow up 23a.

Response	Frequency	Percent
No response	52	8.9
No	108	18.5
Yes	425	72.6
Total	585	100.0

23a. When did your school adopt the changes?

23. Thank you for your time. If you are willing to be contacted for follow up questions please provide your email address. _____ (optional)

Appendix B

6-Item TOK Focus Group Protocol

**Welcome the participants and inform them of the purpose of the study. Distribute and collect "Informed Consents".*

1. The first question relates to your involvement in the TOK course. Could you please share your name, school location, and your particular involvement teaching the TOK course? In your answer, could you also share the extent of your involvement?

2. The next series of questions relate to your perception of the TOK course. What is the purpose of the TOK course? What are the benefits? What are the challenges?

3. Please discuss the effort needed to teach TOK. How does that compare to other courses?

4. Could you please describe the impact of TOK on student learning? How do you feel it impacts learning in DP subjects and other elements of the core? How do you feel it prepares students for future success? How you feel it helps develop the skills/characteristics of the learner profile?

5. Could you also describe the impact of TOK on the teacher? Has teaching the TOK curriculum had an impact on your pedagogical beliefs, intentions, teaching practices, and/or teacher efficacy? Please elaborate.

6. How important is a teacher's approach or teacher efficacy to the success of the TOK course? Do you feel the success of TOK is tied in any way to either or both? Please elaborate.

** Ask participants if there is anything else they would like to share. Participants may submit notes they were writing during focus group or contact the moderator via email.*

Appendix C

Qualitative survey results

15a. Do you enjoy teaching the TOK course?

Code	Frequency
assessment issues	8
lack of guidance	7
don't understand the course material	4
not fun for students	4
TOK Boring	4
course content repetitive	2
not enough PD specific to TOK	2
not enough time	2
paperwork	2
timing of the course	2
course sequence	1
course too long	1
I prefer more concrete subjects	1
language issues	1
not enough collaboration	1
not taken seriously	1
students too young	1
too much paperwork	1

*If no, why not?

Responses were received from 21 participants and coded with the results below. "Assessment issues" and "lack of guidance" were the most common reasons teachers reported not enjoying teaching the TOK.

16. What do you see as the main purpose of TOK? (other)

Responses describing the main purpose of TOK as "other" were received from 86 individuals. "Critical thinking" and "international mindedness" were the most frequent codes. However, "not judging others" and "challenge egocentric" thinking could also be included in "international mindedness" because they are aspects of the IB interpretation of "international mindedness".

Code	Frequency
critical thinking	27
international mindedness	20
personal values	9
can't rank	8
not judge others	8
improve writing and communication	6
connect to content	5
knowledge is different for everyone	4

challenge egocentric thinking	3
challenge students	2
To allow the IB a unique selling point.	2
aims	1
connections between real life and academic ideas	1
high test score	1
historical origins of knowledge	1
holistic	1
interdisciplinary issues	1
passionate about learning	1

17. What do you see as the main benefits to students of participation in TOK? (rank)

Responses describing the main benefits of TOK as "other" were received from 44 individuals. "Critical thinking" and "improve writing/communication" were the most frequent codes.

Code	Frequency
critical thinking	8
improve writing and communication	7
can't rank	6
international mindedness	5
connect to content	4
not judge others	4
personal values	3
knowledge is different for everyone	2

18. What do you see as the main challenges experienced when teaching TOK? (rank)

Responses describing the main challenges experienced when teaching as "other" were received from 73 individuals. "Assessment issues", "time" and "differentiating" were the most frequent codes.

Code	Frequency
assessment issues	62
time	51
differentiating	48
conflict with personal beliefs	23
critical thinking	22
not enough PD specific to TOK	19
lack of guidance	18
connect to content	16
don't understand the course material	16
can't rank	14
not fun for students	7
international mindedness	6
changes every year depending on the class	2
course planning	2

not enough collaboration	2
aims	1
doesn't align with college credit	1
integrate with national curriculum	1
language issues	1
making it relevant	1
timing of the course	1

21. In what ways does the TOK course contribute to success in the areas below?

Responses describing how the TOK course contributes to success were received from 611(option a), 587 (option b), 581 (option c), and 587 (option d) individuals. "Critical thinking" and "connect to content" were the most frequent codes for the category of "other DP subjects". "Critical thinking and "evaluate sources" were the most common codes for the category of "Extended Essay". It seems with the EE category, more "does not [contribute to the success]" codes were identified, possibly because in some situations the EE is completed before TOK (as suggested by one participant). "Critical thinking and "improving writing and communication" were the most common codes for the category of "University Success". "International mindedness" and "not judge others" were the most common codes for the category of "International citizenship/life skills".

Other DP subjects (option a):

Code	Frequency
critical thinking	441
connect to content	439
international mindedness	170
improve writing and communication	116
does not	2

Extended Essay (option b):

Code	Frequency
critical thinking	154
evaluate sources	124
use evidence	120
improve writing and communication	98
does not	33
connect to content	22
international mindedness	16
formulating questions	3
passion for EE	3
research skills	3
inspires EE	1

University success (option c):

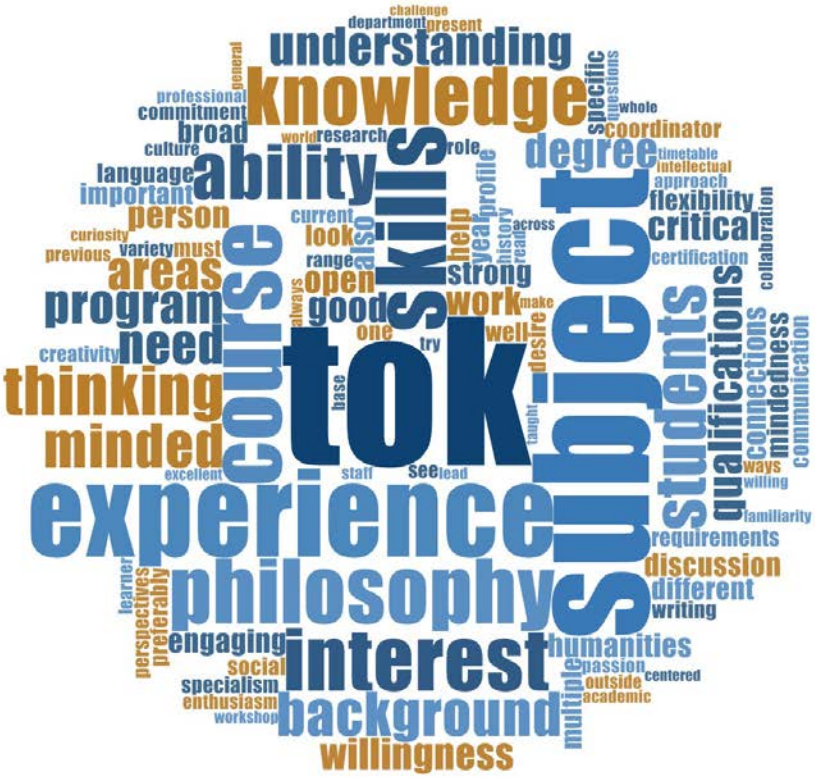
Code	Frequency
critical thinking	226
improve writing and communication	63
evaluate sources	58
use evidence	35
question authority	33
international mindedness	28
not judge others	28
connect to content	25
challenge egocentric thinking	16
does not	15
comfortable with disagreement	2
focus university studies	1
open minded	1

International citizenship/life skills (option d):

Code	Frequency
international mindedness	173
not judge others	170
critical thinking	81
knowledge is different for everyone	47
challenge egocentric thinking	46
evaluate sources	15
does not	11
connect to content	10
improve writing and communication	8
question authority	8
use evidence	8
open minded	1

23. Please provide 5-7 words/phrases to summarize your teaching style

Responses were combined with item 21 from survey B and were collectively analyzed using a word frequency query:



42. In which of the following ways has teaching the TOK provided professional development for you? (other)

Responses were received from 63 participants.

Code	Frequency
critical thinking	21
international mindedness	19
student centered philosophy	17
not judge others	14
connect to content	12
knowledge is different for everyone	9
differentiating	8
challenge egocentric thinking	7
evaluate sources	5
does not	4
use evidence	4
improve writing and communication	3
multiple perspectives	3
question authority	3
assessment	2
constructivist approach	2
inquiry teaching	2
Socratic methods	2
connections between real life and academic ideas	1

emotional intelligence	1
flexibility	1
humor	1
metacognition	1
tolerance	1

44. In which of the following ways do you collaborate with non TOK teachers in your school regarding your TOK course? (other)

Responses were received from 220 individuals. More than 100 codes with a frequency of 1 were produced, therefore only codes with more than 2 occurrences are displayed.

Code	Frequency
guest teachers with expertise	18
not enough collaboration	8
special events	8
answer subject specific questions	6
align topics or content	5
vertical alignment	2

****

END SURVEY A (teachers)

****

SURVEY B

13a. Which the following unique supports do TOK teachers receive? (Other)

Responses were received from 75 individuals.

Code	Number of coding references
workshops	30
advice	7
collaboration in development of materials and activities	6
Mentor	3
OCC help	3
training in the course	3
Meeting time	2
additional salary	1
assessment	1
books	1
Curriculum planning help	1

Reduced load class	1
release time	1
Request substitute for grading	1

14. How much planning time for teaching TOK are teachers given?

Responses were received from 430 individuals. Generally, teachers indicated they were given an hour a day, an hour a week, or that time varied. Teachers also expressed that they were "given the same as other teachers".

15. When are TOK teachers given planning time?

Responses were received from 107 individuals. Generally, responses fell equally into the following categories with significant overlap (frequencies not provided due to overlap):

Summer

Same as for other classes

None

Professional development days

Collaborative weekly planning time

Prep time

Varies

16a. Which the following unique supports do TOK students receive? (Other)

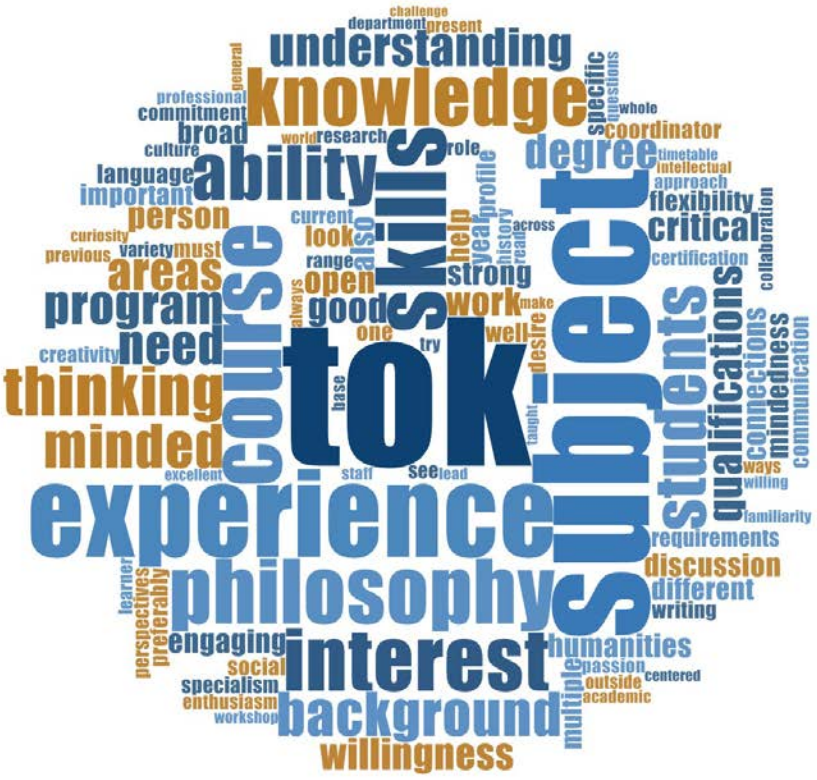
Responses were received from 118 individuals.

Codes	Number of coding references
orientation session	31
one on one meetings	11
pre TOK course	10
online tools	6
summer assignments	5
after school activity to introduce TOK	3
time for college applications	2
support outside school hours	2
extra time	1
field trips	1
guest speakers	1
prep course	1

smaller classes	1

21. What teacher qualifications are most important when hiring or assigning teachers for the TOK course?

Responses were combined with item 21 from survey B and were collectively analyzed using a word frequency query:



Appendix D

Factor Analysis with Principal Component Extraction Results

Reproduced Correlations

		q31N	q32N	q33N	q34N	q35N	q36N	q37N	q38N	q39N	q40N	q41N
Reproduced Correlation	q31N	.420[a]	.224	.411	.376	.458	.486	.421	.338	.287	.152	.087
	q32N	.224	.236[a]	.211	.382	.368	.271	.145	.155	.174	.267	.283
	q33N	.411	.211	.404[a]	.344	.427	.484	.438	.359	.307	.166	.094
	q34N	.376	.382	.344	.687[a]	.675	.405	.135	.116	.138	.262	.315
	q35N	.458	.368	.427	.675	.709[a]	.491	.248	.183	.172	.185	.204
	q36N	.486	.271	.484	.405	.491	.600[a]	.565	.497	.444	.314	.220
	q37N	.421	.145	.438	.135	.248	.565	.685[a]	.618	.541	.316	.157
	q38N	.338	.155	.359	.116	.183	.497	.618	.606[a]	.562	.447	.309
	q39N	.287	.174	.307	.138	.172	.444	.541	.562	.543[a]	.511	.400
	q40N	.152	.267	.166	.262	.185	.314	.316	.447	.511	.760[a]	.733
	q41N	.087	.283	.094	.315	.204	.220	.157	.309	.400	.733	.756[a]
Residual[b]	q31N		.031	-.085	-.092	-.132	-.140	-.092	-.046	-.037	.046	.059
	q32N	.031		.033	-.169	-.182	-.080	.000	.024	-.001	-.088	-.075
	q33N	-.085	.033		-.065	-.121	-.153	-.103	-.032	-.061	.024	.072
	q34N	-.092	-.169	-.065		-.099	-.068	.056	.091	.055	.002	-.083
	q35N	-.132	-.182	-.121	-.099		.045	.016	.017	.047	.011	.002
	q36N	-.140	-.080	-.153	-.068	.045		-.016	-.114	-.026	1.947 E-5	.028
	q37N	-.092	.000	-.103	.056	.016	-.016		-.111	-.141	.009	.045
	q38N	-.046	.024	-.032	.091	.017	-.114	-.111		-.120	-.073	-.013
	q39N	-.037	-.001	-.061	.055	.047	-.026	-.141	-.120		-.062	-.119
	q40N	.046	-.088	.024	.002	.011	1.947 E-5	.009	-.073	-.062		-.152
	q41N	.059	-.075	.072	-.083	.002	.028	.045	-.013	-.119	-.152	

Extraction Method: Principal Component Analysis.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 31 (56.0%) nonredundant residuals with absolute values greater than 0.05.

Anti-image Matrices

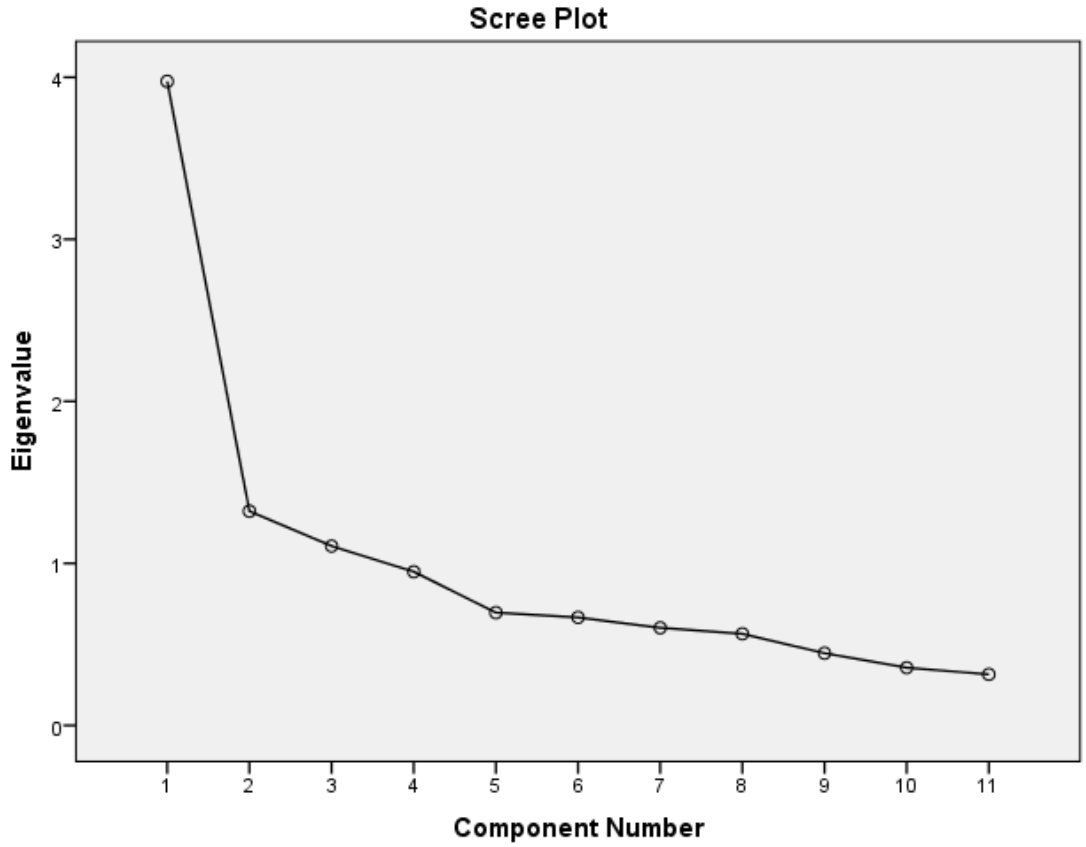
		q31N	q32N	q33N	q34N	q35N	q36N	q37N	q38N	q39N	q40N	q41N
Anti-image Covariance	q31N	.773	-.116	-.109	-.054	-.062	-.034	-.068	-.054	-.030	-.037	.045
	q32N	-.116	.866	-.099	-.055	-.009	-.004	-.010	.006	-.033	.007	-.100
	q33N	-.109	-.099	.785	-.051	-.054	-.033	-.068	-.093	-.002	.012	-.006
	q34N	-.054	-.055	-.051	.636	-.280	.030	.010	-.040	.016	-.055	-.017
	q35N	-.062	-.009	-.054	-.280	.537	-.201	.035	.037	.001	.037	-.033
	q36N	-.034	-.004	-.033	.030	-.201	.531	-.202	-.035	-.104	-.017	-.027
	q37N	-.068	-.010	-.068	.010	.035	-.202	.632	-.154	-.030	-.034	.006
	q38N	-.054	.006	-.093	-.040	.037	-.035	-.154	.665	-.161	-.039	-.048
	q39N	-.030	-.033	-.002	.016	.001	-.104	-.030	-.161	.674	-.163	.022
	q40N	-.037	.007	.012	-.055	.037	-.017	-.034	-.039	-.163	.570	-.298
	q41N	.045	-.100	-.006	-.017	-.033	-.027	.006	-.048	.022	-.298	.641
Anti-image Correlation	q31N	.899[a]	-.142	-.140	-.076	-.096	-.053	-.098	-.075	-.042	-.056	.064
	q32N	-.142	.870[a]	-.121	-.074	-.013	-.006	-.014	.008	-.043	.010	-.134
	q33N	-.140	-.121	.901[a]	-.072	-.083	-.051	-.097	-.129	-.003	.017	-.009
	q34N	-.076	-.074	-.072	.756[a]	-.479	.052	.015	-.062	.024	-.092	-.026
	q35N	-.096	-.013	-.083	-.479	.714[a]	-.376	.060	.062	.001	.066	-.056
	q36N	-.053	-.006	-.051	.052	-.376	.809[a]	-.349	-.058	-.174	-.031	-.047
	q37N	-.098	-.014	-.097	.015	.060	-.349	.830[a]	-.238	-.046	-.057	.010
	q38N	-.075	.008	-.129	-.062	.062	-.058	-.238	.863[a]	-.241	-.064	-.074
	q39N	-.042	-.043	-.003	.024	.001	-.174	-.046	-.241	.849[a]	-.263	.033
	q40N	-.056	.010	.017	-.092	.066	-.031	-.057	-.064	-.263	.746[a]	-.493
	q41N	.064	-.134	-.009	-.026	-.056	-.047	.010	-.074	.033	-.493	.734[a]

a. Measures of Sampling Adequacy(MSA)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.810	34.639	34.639	3.810	34.639	34.639	2.395	21.771	21.771
2	1.333	12.119	46.758	1.333	12.119	46.758	2.107	19.152	40.923
3	1.093	9.936	56.694	1.093	9.936	56.694	1.735	15.771	56.694
4	.937	8.515	65.209						
5	.715	6.501	71.710						
6	.696	6.329	78.039						
7	.657	5.969	84.008						
8	.589	5.351	89.359						
9	.472	4.294	93.653						
10	.372	3.379	97.032						
11	.326	2.968	100.000						

Extraction Method: Principal Component Analysis.



Communalities

	Initial	Extraction
q31N	1.000	.403
q32N	1.000	.256
q33N	1.000	.394
q34N	1.000	.671
q35N	1.000	.699
q36N	1.000	.574
q37N	1.000	.628
q38N	1.000	.577
q39N	1.000	.533
q40N	1.000	.751
q41N	1.000	.751

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
q31N	.556	.258	-.165
q32N	.422	.132	.246
q33N	.540	.255	-.191
q34N	.553	.481	.365
q35N	.604	.538	.209
q36N	.722	.100	-.207
q37N	.639	-.119	-.453
q38N	.635	-.270	-.319
q39N	.613	-.363	-.161
q40N	.605	-.507	.358
q41N	.535	-.421	.536

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix[a]

	Component		
	1	2	3
q31N	.449	.448	-.020
q32N	.094	.426	.256
q33N	.457	.428	-.042
q34N	.034	.802	.163
q35N	.167	.817	.052
q36N	.623	.411	.130
q37N	.780	.114	.081
q38N	.712	.048	.260
q39N	.605	.023	.408
q40N	.265	.098	.819
q41N	.076	.186	.843

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Component and Rotated Component Matrix after forced extraction of 2 factors

Component Matrix[a]

	Component	
	1	2
q31N	.556	.258
q32N	.422	.132
q33N	.540	.255
q34N	.553	.481
q35N	.604	.538
q36N	.722	.100
q37N	.639	-.119
q38N	.635	-.270
q39N	.613	-.363
q40N	.605	-.507
q41N	.535	-.421

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Rotated Component Matrix[a]

	Component	
	1	2
q31N	.577	.207
q32N	.393	.203
q33N	.564	.198
q34N	.732	.047
q35N	.808	.042
q36N	.584	.436
q37N	.371	.534
q38N	.262	.638
q39N	.181	.689
q40N	.074	.786
q41N	.085	.675

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Component Matrix after forced extraction of 1 factor (with 1 solution no rotation)

Component Matrix[a]

	Component
	1
q31N	.556
q32N	.422
q33N	.540
q34N	.553
q35N	.604
q36N	.722
q37N	.639
q38N	.635
q39N	.613
q40N	.605
q41N	.535

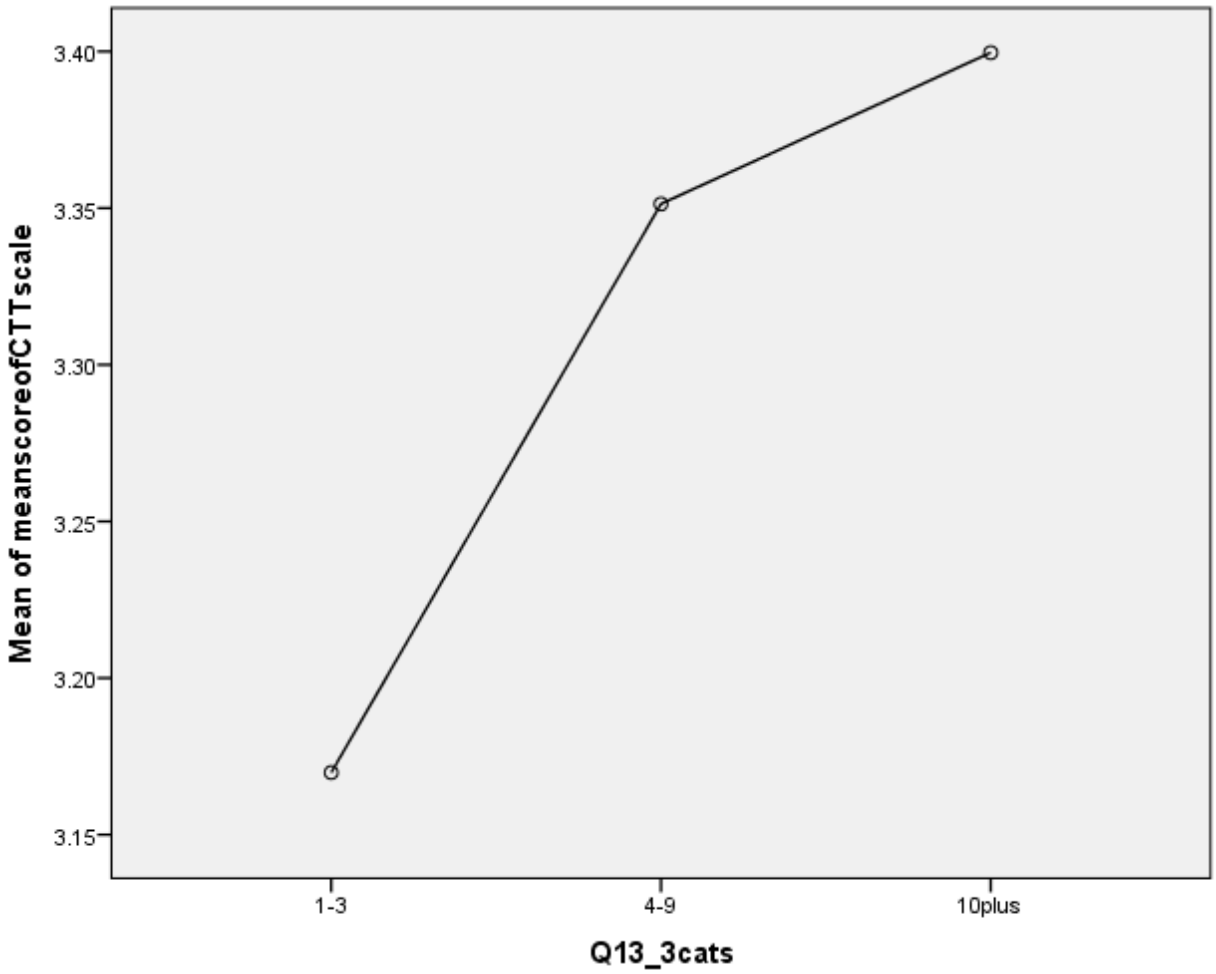
Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix E

Linear Contrast Analysis

Means plot suggesting linear trend:



Linear term is significant in the new ANOVA:

ANOVA

CTT_allitemsscore

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		6.405	2	3.203	16.484	.000
	Linear Term	Unweighted	4.068	1	4.068	20.936	.000
		Weighted	5.762	1	5.762	29.657	.000
		Deviation	.643	1	.643	3.312	.069
Within Groups			129.203	665	.194		
Total			135.608	667			

Adjusted:

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
CTT_allitems score	Assume equal variances	1	.2298	.05023	4.576	665	.000
	Does not assume equal variances	1	.2298	.04786	4.802	214.167	.000

Effect size results:

Test Results

Dependent Variable: CTT_allitemsscore

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	6.405	2	3.203	16.484	.000	.047
Error	129.203	665	.194			