

*Exploring Classroom Interactions to Facilitate the Tacit Knowledge Construction of International Baccalaureate Secondary School Students in Hong Kong*

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The Asian Conference on Education 2023  
Official Conference Proceedings

**Abstract**

In an interconnected and global society that is rapidly changing, it becomes imperative to equip students with the required tacit life skills to meet the challenges of the modern world. The International Baccalaureate (IB) is a highly regarded educational system providing a holistic and interdisciplinary approach that nurtures its students as global citizens with a broad cultural perspective. This study investigates the acquisition of tacit skills and the construction of tacit knowledge of secondary school IB students in Hong Kong. The focus is on the role of social interactions in the classroom that facilitates its construction. A mixed-method approach was designed for data collection and analysis. The study's outcomes contribute towards developing a framework and suggest teaching strategies for effective tacit knowledge construction. The paper discusses the findings of a pilot study conducted in an IB school in Hong Kong.

Keywords: Tacit Knowledge Construction, IB Classroom Interactions, Social Interactive Spaces

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## **Introduction**

The International Baccalaureate (IB) educational program is becoming increasingly widespread as setting high standards for education. With its global vision and rigorous approach, it provides a qualification that universities around the world recognise. The IB seeks to foster its students with the knowledge and adaptability to succeed in a global society that is beyond the scope of traditional academic learning. Not only do IB students learn to think about global issues through multiple perspectives critically, but they also learn to appreciate other cultural perspectives.

The IB education system is popular in higher education because it focuses on teaching essential life skills like critical thinking, creativity, and problem-solving. However, in addition to these tacit skills, success in the modern world requires cultivating other soft skills like communication, collaboration, and compassion, all of which are emphasised. Furthermore, this holistic teaching approach equips students for lifelong learning and public engagement, making them well-rounded individuals. Thus, the IB method emphasises a student's academic success and development as a person, socially and emotionally.

Tacit knowledge is considered troublesome (Perkins, 2006) and difficult to teach and acquire. It is because "teachers' more seasoned presumptions can operate like conceptual submarines that learners can never manage to detect or track" (Perkins, 2006, p. 40). It can be demonstrated, but the onus is on the learner to grasp the meaning of the demonstration (Polanyi, 1966). Therefore, such knowledge is constructed by the learner through a self-reflective and interactive process. Though considered to be constructed mainly through hands-on learning, studies by Venkatesh (2021) in design education have revealed the multidimensional aspect of tacit knowledge construction. This study expands the research of Venkatesh's study on design students at the University to study the tacit knowledge construction of secondary school IB students in Hong Kong, an area with limited explorations.

### **What is the IB About, and When Did It All Start?**

The IB was established in 1968 as a non-profit educational foundation in Geneva, Switzerland. Intending to address the issue of "curricula internalisation" for globally mobile students, the educators sought a "universal pedagogy" that would allow students to qualify in any university around the world (Hill & Saxton, 2014, p. 43). Its neoliberal approach and emphasis on international-mindedness appealed to countries like the US, where it spread rapidly. Subsequently, many other countries started to adopt the IB curriculum, expanding the IB community from private international schools for internationally mobile students to state and public schools (Hill & Saxton, 2014). More than 7,800 programs were being offered in 159 countries by the beginning of April 2023, spread among more than 5,600 schools. A growth of 34.2% in IB programmes was recorded from 2018 to 2022. 46.6% of the total number of programmes were taught in The Americas, 30.5% in Asia-Pacific and 23% in Africa, Europe and Middle-east (IBO, 2022a).

Four excellent international education programmes are implemented by schools with support from the IB. The Primary Years Programme (PYP) for ages 3 -12, Middle Years Programme (MYP) for ages 11 – 16, Diploma Programme (DP) for ages 16 – 19 and the IB Career-related Programme (CP) for ages 16 – 19. Centered around the learner, the IB learner profile

aims to nurture ten learner attributes using effective teaching and learning approaches through a "broad, balanced, conceptual and connected curriculum" (IBO, 2017, p. 1).

All IB programmes are grounded on the constructivist approach of teaching and learning, asserting that knowledge and meanings are actively constructed by the learner based on prior experiences and social interactions that constantly change with new situations (Mertens 2010; Lincoln et al., 2011). IB programmes are intended to foster intellectual curiosity in young people and provide them with the knowledge, conceptual understanding, skills, reflective practices, and attitudes" necessary to become independent lifelong learners (Hill & Saxton, 2014, p. 45). To aid constructivist learning, IB teachers use pedagogical approaches like project- and conceptual-based learning. IB programme students are "encouraged to explore and construct their own personal and cultural identities" (IBO, 2022b).

### **The IB in Hong Kong**

The IB World School has been around in Hong Kong since 1988. As of 2023, 70 schools offer one or more IB programmes. Forty-one schools offer PYP, 16 offer MYP, 37 offer the DP programme, and seven offer Career-related programmes (IBO, 2022c). Sixty of these schools are private schools, and ten are state-owned. Seven schools that offer IB in Hong Kong are under the English Schools Foundation (ESF), Hong Kong's largest international educational organisation in teaching in the English medium. Nine schools that offer the DP programme come under Hong Kong's Direct Subsidy Scheme (DSS), which "provides a "middle way" in the education market between international schools and the national curriculum at local schools "(Lee et al., 2022).

A deregulatory policy in Hong Kong allows the DSS schools to run a flexible curriculum incorporating the IB programme. According to Lee et al. (2022), the IB as an international education of choice is driven by three factors – the policymakers' view that it is a progressive alternative to the local education system, its position as a global trend and its portrayal by the media as a "distinctively well-rounded education". The marketing may have prompted many affluent local families in Hong Kong to opt for IB international schools (p. 136).

### **Benefits and Challenges in the IB Educational System**

Dickson et al. (2020) assess the benefits and challenges of the MYP programme in Australia by examining teacher and school leader perceptions of the MYP's effectiveness in fostering student learning. Results revealed that the inquiry-based approach made students better problem-solvers of global issues through an interdisciplinary approach that made students connect to real-world experiences. In addition, the participants reported the development of learning skills such as time management, independence, ownership, research, reflection, and resilience. Besides, the programme provides a "transferrable education" for mobile students to adjust to a familiar learning methodology as they move schools between different countries (p. 192). Finally, the researchers add that the well-structured assessment criteria allow MYP students to achieve higher learning results.

In contrast, in a study conducted on DP alums from Hong Kong, there was a perception that mainstream schooled students were more accustomed to a teacher-centric approach, memorisation, with no peer interactions, the acquisition of specialised knowledge and assessment-based examinations (Wright & Lee, 2022). The preparation for IB students' adaptation to the academic life of Hong Kong universities are therefore questionable (p. 703).

Among the challenges faced by the IB system, the main ones are the high expectations it entails from teachers and students. The IB requires higher teaching expertise and learning a new curriculum (Doherty & Shield, 2012). The problem is exacerbated when a school offers a dual curriculum. In this case, the high cost of running the IB programme causes a strain on teachers' time in running bifurcated classrooms, adopting different assessment modes, and strain on the school's resources (Doherty & Shield, 2012). Lower-ability Inquiry-based learning can demoralize non-academic students, making them feel alienated from the programme. (Dickson et al., 2020, p. 197).

### **What Is Tacit Knowledge Construction?**

In the view of Nonaka and Takeuchi (1995, pp. 23-24):

Tacit knowledge is highly personal and difficult to formalise, communicate, or share with others. Subjective insights, intuitions and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in action, an individual's commitment to a specific context, and the ideals, values, or emotions they embrace.

As tacit knowledge is subjective and individualist, constructivist theories resonate with tacit teaching. Burbules (2008) promotes tacit teaching that is neither standardised nor geared toward explicit learning outcomes (p. 669). Instead, it facilitates inquiry-based learning by enabling learners' inferences, connections, and comprehension. A constructivist approach is effective for teaching students to solve complex and ill-structured problems (Ertmer & Newby, 2013, p. 60). According to Andjomshoaa et al. (2011), emphasising knowledge as a constructivist process leads to significant learning outcomes and knowledge retention. The retained knowledge generates tacit knowledge over time.

Constructivism suggests the active participation of learners in knowledge construction. Learners draw from prior experiences and go through an experiential cycle of making and reflecting. Engagement in generative activities results in the creation of new knowledge (Collis & Moonen, 2005). Meanings are shaped and re-shaped through social interactions and discourses. Activities such as brainstorming, concept development or problem-solving are creative pursuits that are tacit knowledge domains. Hence, tacit knowledge construction is "a generative process where an individual is actively engaged to create new and tacit outcomes" (Venkatesh & Ma, 2021a, p. 43). The new knowledge is explicated either visually or verbally. Figure 1 illustrates the components of tacit knowledge construction.

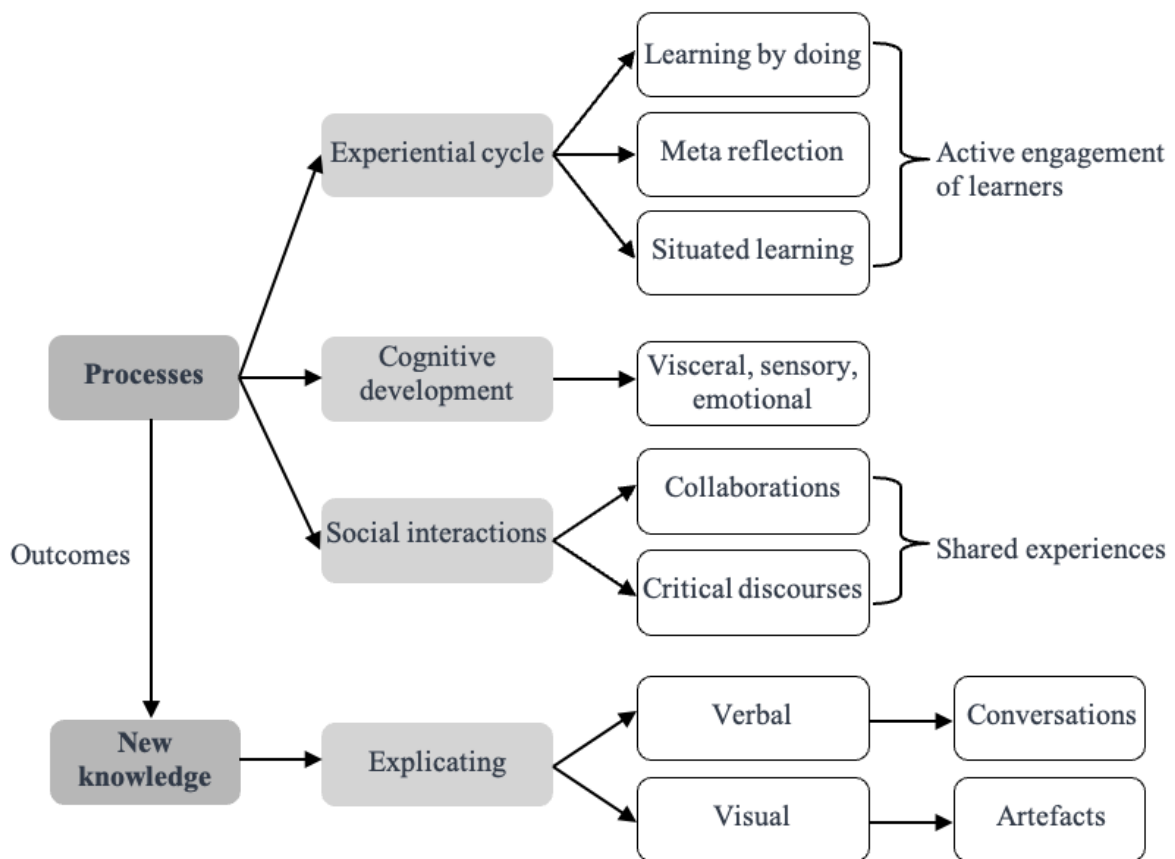


Figure 1: Components of Tacit Knowledge Construction, adapted from Venkatesh & Ma (2021a, p. 44)

### Social Interactions in the Education Environment and Tacit Knowledge Construction

Constructivism is a combination of a cognitive dimension and a socio-cultural dimension. Cognitive theorists like Jean Piaget emphasise that Constructivism is an internal process in which one constructs mental models that are unique to themselves (Von Glaserfeld, 2005). Notable socio-cultural perspectives of Constructivism, such as Vygotsky's Zone of Proximal Development and Bruner's Scaffolding theory, emphasise the influence of social interactions on learning. Lave and Wenger (1991) argue that knowledge is socially co-constructed and situated in a particular context and environment.

Personal experiences embody tacit knowledge. Continuous environmental change creates new mental models and learning (Koskinen et al., 2003). However, Loenhoff (2015) claims that the body can only communicate tacit knowledge through its relationships with other agents. Thus, tacit knowledge is collective, context-dependent, embodied in "social habituations" and includes "cultural capital" (Loenhoff, 2015; Mareis, 2012, p. 70).

According to Nonaka and Takeuchi (1991), knowledge conversion between the tacit and explicit is a social process (pp. 109-110). Social interactions in the classroom can occur between the teacher and student, between students, inside and outside the classrooms, in physical and virtual settings. Collaborative learning and peer learning are the many ways of interaction that facilitate tacit knowledge construction. Additionally, the cultural atmosphere of the educational setting has the potential to provide a wide variety of different sources of

learning experiences for the students, impacting the students' cycle of experiential learning (van Boeijen, et al., 2017).

Venkatesh and Ma's studies (2021b) on conversations in the design studio reveal the link between critical conversations and tacit knowledge construction. They identify the components of critical conversations as socialisation, cognition and articulation. When multiple perspectives are critically analysed and assessed in the backdrop of social and collaborative environments, the result is the generation of new tacit sensibilities, values, and meanings (p. 7). Knowledge is also co-constructed through design artefacts in the social environment that are mediators, provokers or articulators of critical conversations (Figure 2).

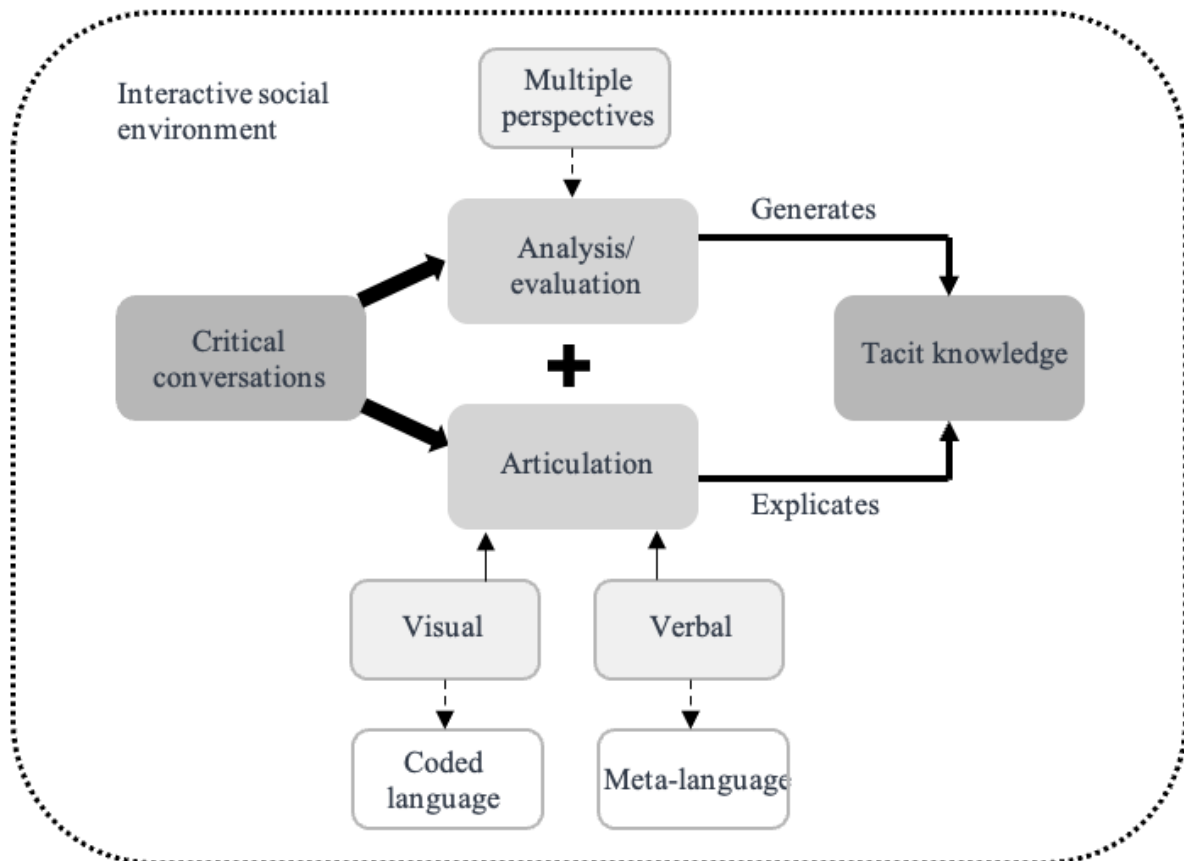


Figure 2: Critical Conversations Lead to Tacit Knowledge Construction, adapted from Venkatesh & Ma (2021b, p. 7)

Social interactions are increasingly taking place in online and virtual settings, as evidenced by the COVID pandemic. Supported by multi-media and virtual and augmented realities, online interactions expand the sharing of experiences, knowledge, values and beliefs (Oztok, 2013). The synchronous and asynchronous settings afforded by these environments act as a store for knowledge resources and provide opportunities for prolonged and flipped learning beyond the classroom. Besides, the current explosion of Artificial Intelligence chatbots such as the ChatGPT is redefining the sociocultural environment of educational settings. These are potential areas for educational research.

## **What is Missing?**

Despite the many studies conducted on the IB programme, little is known about the tacit knowledge construction processes IB students engage in. Experience and hands-on learning are common sources of tacit knowledge. Developing tacit knowledge is aided by the IB's emphasis on inquiry-based learning and the cultivation of students' abilities to reflect on and articulate their own learning processes. On the other hand, studies have shown that social interactions externally influence tacit knowledge construction in the learning environment. Therefore, improving the efficacy of the IB curriculum and enriching students' learning experiences requires a deeper understanding of how IB students construct tacit knowledge.

Further studies are needed to learn how IB students get the tacit skills necessary to compete in the modern, rapidly changing global economy. In particular, there is a shortage of empirical studies on the role of social interactions in the IB classroom in constructing secondary school students' tacit knowledge. Therefore, this study attempts to address the knowledge gap by trying to answer the following research questions:

1. How does the interactive environment of the International Baccalaureate (IB) classroom facilitate the construction of tacit knowledge among secondary school students?
2. What are the perceptions of secondary school IB students about the role of the interactive environment of the classroom for the construction of their tacit knowledge?
3. What challenges do IB teachers face to facilitate an interactive environment for effectively constructing secondary school students' tacit knowledge?
4. How do IB teachers help secondary school students leverage their tacit knowledge?

The study aims to develop an understanding of teaching and learning practices for effective tacit knowledge construction.

Objectives of the research are:

- To identify and investigate the kind of interactive spaces in the IB classroom that facilitate IB students' tacit knowledge construction
- To understand the issues faced by IB teachers in creating interactive learning environments for tacit knowledge construction
- To examine IB teachers' strategies and techniques to help their students leverage their tacit knowledge
- To share the insights of the study with the IB teachers to help them develop effective strategies for students' tacit knowledge construction

## **Research Design**

Participants of the study are chosen through a purposive sampling of secondary school students and their respective teachers in the MYP and DP programmes of two or three IB schools in Hong Kong. The study uses a mixed-method approach using quantitative and qualitative data collection methods conducted in two phases. Phase one is a pilot study that observes the interactions between teachers and students in secondary school classrooms of one IB school. This paper discusses the data collection, analyses and findings of the pilot study.

Phase two will involve conducting observations and semi-structured interviews with participants from other IB schools. Additionally, a subset of students will participate in a

focus group to encourage sharing experiences and knowledge, thereby capturing qualitative data through questioning and critical discussions.

A professional protocol with the participants was maintained throughout the research. Participants were communicated to seek their consent before the study. The researchers followed the ethical standards established by the University for conducting research involving human participants. Consent forms along with an information sheet were sent to all participants or their parents in case of minor-aged participants. Their identities remain anonymous. They were notified that they were free to leave the study at any point. All data was kept in the safe possession of the researchers.

### **Significance and Possible Outcomes of the Study**

This study is anticipated to provide insights into the classroom interactions that support the construction of tacit knowledge among students attending IB secondary schools in Hong Kong, thus addressing the knowledge gap in this area. The study outcomes will be shared with all the participants and the wider educational community through reports and journal articles. It will bring critical awareness to educators and students of existing teaching and learning practices in the IB system.

Different interactive spaces that will be identified will be developed into a conceptual framework for tacit knowledge construction that may be adapted in various educational settings. The framework can be expanded as future studies add new knowledge to this field of study. The findings will lead to the development of effective pedagogical strategies for IB teachers to encourage tacit knowledge construction among the students in their classrooms. In addition, recommendations will be provided to schools and policymakers on improving the IB program's efficiency in encouraging students from various cultural backgrounds to create tacit knowledge.

A collaboration between the University and secondary school, such as this study, promotes knowledge sharing between the two parties. New teaching and learning practices developed through research can enhance student learning outcomes and prepare them for higher education and future careers. Universities, in turn, understand the skillset and mindset of students entering their programmes. In addition, a commitment to research and academic excellence can enhance institutional standing. Consequently, it opens new research opportunities that provoke further investigation.

### **Pilot Study - Research Setting and School Background**

An IB school in Hong Kong was chosen as an appropriate school to conduct the preliminary study. It is a school that is dedicated to IB education, offers Primary Years Programme (PYP), Middle Years Programme (MYP) and Diploma Programme (DP). The school follows a pupil-centered approach that strives to instill a sense of community and responsibility among its students. It has an international outlook that promotes cross-cultural communication and collaboration amongst its members. An entrepreneurial spirit that encourages new ideas and allows students to take risks is part of its DNA. Learning through inquiry, hands-on learning, and project-based learning are ways by which experiential learning is emphasised.

The pilot study helped in understanding the research context such as the IB programme, the learning environment and the key members. It provided an opportunity to test methodological



procedures and research methods. More importantly, as stressed by Lofland et al. (2006), choosing the site is crucial in testing the feasibility of obtaining rich data and achieving familiarity with the participants.

### **Data Collection Methods**

A total of 12 observations and four interviews were conducted between April 2023 and May 2023. The survey questionnaires were sent out in June 2023. Participants in the observations and interviews comprised 48 students and four teachers. Only the teachers were interviewed. The students ranged from year groups 9 to 12. The students were part of the 127 who had taken the design subject. Each observation session lasted for 55 minutes. The purpose of the observations was to capture the dynamic interactions in the natural settings of the classroom. Therefore, the researcher adopted an unobtrusive position of a non-participant observer. Data was captured through notes, photographs, audio, and video recording. Notes were transcribed on MS Word.

Each interview lasted for 45 to 60 minutes, conducted over Zoom meetings. Interview questions were semi-structured based on the literature review and observations. Questions started with background questions on educational and work experiences and teaching approaches. This was followed by questions on the project brief, scaffolding of the design process, facilitation of tacit skills, role of technology in classroom interactions, strategies for solving group problems, and learning after school hours. Transcriptions obtained from Zoom meetings were saved on MS Word.

Survey questionnaires were sent out to all 127 design students. Questionnaires consisted of five sections: 1) Statement of purpose of the research with working definitions of tacit knowledge and social interactions 2) Background information which collected the demographics of students, 3) The design process - attitudes of students towards designing, 4) The role of classroom interactions in tacit learning – perceptions of students on the importance of interactions, time and attitudes in participating in critical discussions, 5) Extended study – motivation to study after school hours.

### **Data Evidence**

The data collection was guided by the research questions and conceptual framework developed from the literature review. Supporting evidence sources consisted of project briefs, lesson plans and assessment criteria shared by the design teachers from each year group.

### **Data Analyses**

The qualitative data analysis was adapted from the works of Miles et al. (2014), Merriam and Tisdell (2016), and Schatzman and Strauss (1973). The process began with transcribing the field observations. A summary sheet for each observed session was created, noting insights and possible interview questions. It was followed by interview transcription and progressed via coding, note creation and consolidation, and the development and breakdown of analytic categories related to the study issue. The coding methods were developed using the conceptual framework. The MAXQDA program was then used to create codes and generate memos.

A descriptive analysis was performed to simplify the data, identify patterns, pinpoint problems, and evaluate sources of error in the quantitative data (Loeb et al., 2017). The statistical studies were performed using SPSS, including frequency analyses, cross-tabulation, and variable correlation.

Finally, insights were drawn from the memos, which along with the quantitative analysis are interpreted into research findings as discussed in the findings chapter. This part of the analysis followed the 'integrative data analysis' procedure described by Creswell and Creswell (2023, pp. 246-247). The intent was to connect the two types of data as a joint display of quantitative scores and qualitative themes.

## **Findings for the Research Questions**

Since there were many, only significant findings for each research question are discussed below.

RQ 1: How does the interactive environment of the International Baccalaureate (IB) classroom facilitate the construction of tacit knowledge among secondary school students?

An unstructured, open and flexible interactive environment facilitates tacit knowledge construction: The physical and visual elements observed in the classrooms, such as the seating arrangements and artefacts, made it possible for interactions. Teachers Bryant and Smith mentioned that an open environment allows students to look at and question each other's work. It also includes accommodating different learning styles, exploring through play (teacher Edward), and the freedom to express through multiple mediums (Bryant). The embracing of AI by all teachers added to the multi-dimensionality of the learning experiences. The visual environment in the classroom triggered a learning spark or provided design inspiration for 22.2% of surveyed students.

The liminal space of self-reflection and learning awareness is required for tacit knowledge construction: Teacher Taylor encouraged students to make and reflect on mistakes through the design cycle. The reflective element in each unit further enables the students to be aware of their learning process. Teachers use tools like tracking sheets, learning studios and google sites for reflection. According to teacher Bryant, students continue reflecting on the project outside the classroom by making real-world connections. 19% of them mentioned that self-reflection led to a learning spark in them (q7).

Most surveyed students were aware that they had learnt something new through classroom interactions (68.6%). This is evidence for tacit knowledge acquisition. Following are examples of what students learnt through interactions:

"A different view or approach to both the solution of a problem and the problem itself (empathy and experiences)".

"New skills for easier production, stepping out of my comfort zone and learning from mistakes".

"I learnt a lot about each and every person's individual strengths and weaknesses".

A celebratory culture and a trustful and comfortable environment can encourage the construction of tacit knowledge: Using technology to facilitate interactive discussions allows students to "express their thoughts and ideas in a safe and supportive environment" (Smith). It includes entrusting students to take on learning responsibilities, such as taking leadership and initiatives to enable collaborative learning by creating groups and assigning roles (Bryant & Edward). Therefore, an interactive environment encourages collaboration and learning from peers. Teacher Bryant mentioned that he attempts to prioritise social needs over academic ones.

Apart from that, as quoted by teacher Edward, a culture that is a "celebration, or even the rewarding of failure in the classroom, can lead to an appetite for risk-taking and creativity". Correspondingly, 48.6% of students in the survey responded that they agree that they were willing to take risks in designing without fear of failure. Age had no significance with risk-taking ( $p = .197$ ). Teachers Edward, Smith and Taylor added that the learning community in the classroom is built by empowering students, giving them a sense of belonging.

RQ2: What are the perceptions of secondary school IB students about the role of the interactive environment of the classroom for the construction of their tacit knowledge?

Value for collaborative engagement and critical discussions: Students were equally comfortable sharing opinions and ideas with their teachers and peers (44.3%). The two had a significant positive correlation ( $p = .004$ , Spearman Correlation Coefficient = .343), (Figure 3). A statistically significant positive correlation was seen between challenging others and being challenged by others ( $p = .001$ , Spearman Correlation Coefficient = .522), (Figure 4).

➔ **Nonparametric Correlations**

[DataSet1] C:\POST DOC RESEARCH\IB\PILOT STUDY MALVERN\SURVEY\ANALYSIS\SPSS\sharing with teachers vs sharing with peers\raw data cleaned.sav

**Correlations**

			sharingwithtea chers	sharingwithpe ers
Spearman's rho	sharingwithteachers	Correlation Coefficient	1.000	.343**
		Sig. (2-tailed)	.	.004
		N	70	70
	sharingwithpeers	Correlation Coefficient	.343**	1.000
		Sig. (2-tailed)	.004	.
		N	70	70

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Figure 3: Correlation between Sharing Opinions with Teachers and Peers

➔ **Nonparametric Correlations**

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**Correlations**

			challengepeer s	peerschalleng e
Spearman's rho	challengepeers	Correlation Coefficient	1.000	.522**
		Sig. (2-tailed)	.	<.001
		N	70	70
	peerschallenge	Correlation Coefficient	.522**	1.000
		Sig. (2-tailed)	<.001	.
		N	70	70

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Figure 4: Correlation between Challenging and being Challenged by Peers

52.9 % of students sometimes participated (Y10 and Y11) in critical discussions in the classroom, followed by 35.7 % who often participated (Y9 and Y12). 52.9% said a moderate amount of time was spent on critical discussions, followed by 31.4% who responded that some time was spent on the discussions. The participation of students had a significant and positive correlation to the time spent on the discussions ( $p = .002$ , Spearman Correlation Coefficient = .358), (Figure 5).

➔ Nonparametric Correlations

		Correlations	
		participation	timefordiscussions
Spearman's rho	participation	Correlation Coefficient	1.000
		Sig. (2-tailed)	.002
		N	70
	timefordiscussions	Correlation Coefficient	.358**
		Sig. (2-tailed)	.002
		N	70

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Figure 5: Correlation between Participation and Time Spent on Discussions

Tacit learning through interactions: 42.9 % of students responded that interactions were moderately important, and 37.1% responded interactions were very important in gaining tacit skills. 68.6% of surveyed students were aware that they had learnt something new through classroom interactions. Most students (56.3%) responded that critical discussions through interactions had triggered a learning spark or provided design inspiration for them.

Motivation to self-study: 51.4% of students partook in after-school learning through self-study, whilst 31.4% engaged in a combination of self-study and interaction with their peers. Regarding motivation, a majority of students (51.4%) indicated intrinsic motivation, and 41.4% cited extrinsic motivation. Examples of intrinsic motivation were enjoyment in learning, self-interest, exciting topic, passion for the topic, learning something new and curiosity. Extrinsic motivation came from meeting deadlines, getting better grades, using external aids like music and YouTube videos, and betterment in their career.

RQ3: What challenges do IB teachers face to facilitate an interactive environment for effectively constructing secondary school students' tacit knowledge?

Overcoming distractions: The difficulty for IB teachers is creating an engaging and focused learning atmosphere, despite distractions. Teachers overcame this challenge by providing external motivation through competition (Bryant & Taylor), active feedback sessions (Bryant) and grades (Edward). An exciting project could keep students internally motivated (Smith). On the other hand, a grade-driven mentality could hinder learning (Bryant & Edward). Smith commented that students didn't look at written feedback from teachers.

Cultivating favourable interpersonal relationships: Dealing with conflicts and tensions within the groups was a challenge faced by all the teachers. Reasons included differences in group personalities (Edward) and learning styles (Smith), and different strengths and weaknesses of students (Edward & Taylor). Teacher Taylor added that the COVID pandemic had affected the social interactive skills of students. Although collaborative projects are challenging to

assess, they help students "develop skills like project management, branding, marketing, negotiating, and delegating" (Edward).

Obstacles in creative endeavours: Teacher Taylor explained students could not generate design ideas which affected design thinking and creative skills. He mentioned the absence of fundamental drawing skills necessary for creating effective visuals. While the other teachers believed that an open design brief leads to interpretation and exploration, Taylor felt that a broad design brief was difficult to understand. Thirdly, a lack of time was a constraint in holding meaningful discussions that could trigger creative ideas.

RQ4: How do IB teachers help secondary school students leverage their tacit knowledge?

Using the iterative learning approach in design: All the IB teachers emphasised using the design cycle, through conceptual explorations, brainstorming, ideation, testing and prototyping to leverage students' tacit skills. While teacher Bryant stresses hands-on experiences through prototyping and testing, teachers Edward and Taylor stress the reflective element is inherent and implicit in the evaluation stage. 51.4% of the students agreed that prototyping was extremely important to gain tacit skills in the design process, and 30% strongly agreed.

Helping students make real-world connections and cultivating empathy: Teachers set the design problems in authentic contexts that help students connect to their previous learning experiences. Students are urged to use empathy while problem-solving as it allows them to think through other people's perspectives (Edward & Smith). In the words of teacher Bryant, "Empathy is a powerful design skill and one that is difficult to quantify. It encourages personal investment and motivation in the work".

Promoting student agency: Teacher Bryant considers the IB curriculum a "wonderful platform for pupil agency". Rather than prescribing a problem, he prefers giving a context to students to recognise the problem. Teacher Edward stated, "I'm just facilitating learning and putting in a culture where those kids can take ownership and personalise their learning for themselves. I'm not telling them what to do". Teachers Edward and Smith consider student-led critical discussions can lead to success in group work and lead to an "appetite for risk-taking and creativity" (Edward). From a pedagogical stance, teacher Edward was inclined towards positioning himself at the same or lower level as the students, expecting the teachers and students to learn from each other.

Students are also encouraged to select a topic of personal interest to foster emotional engagement in their learning. 48.6% of the students agreed they preferred to identify a design problem that suited their interest. 28.6% were neutral, and 14.3% strongly agreed. Age had no significance in identifying design problems ( $p = .4$ ). Accordingly, teachers mentioned they vary their instruction style to engage students and allow their products to be executed in various ways. It further implies that teachers understand the strengths and weaknesses of their students (Edward).

## **Meta Inferences and Discussions**

Tacit knowledge construction is a continuous process of development and transformation. It needs a dynamic and adaptive interactive environment that is flexible and open, accommodates different learning styles, uses various educational tools for learning, and

provides multiple mediums for exploring and expressing ideas. In other words, a multidimensional IB interactive classroom that embodies the physical, sensory, social, and technologically adapted stimulates tacit knowledge construction.

The interactive classroom environment supports experiential learning in the design cycle. Students' tacit knowledge develops throughout the iterative design cycle process, in which they are actively engaged in hands-on learning, problem-solving, and critical conversations. Working in authentic contexts and real-life problems gives students the opportunity to apply previous knowledge, try new approaches through risk-taking and learn from failures. Students can apply different perspectives to problem-solve and develop critical skills by challenging each other in a healthy environment. Empathetic skills are honed when seeing the world through others' worldviews. Critical conversations with peers ignite creative and learning sparks.

Tacit skills aid the learning-to-learn process. Interactions in the classroom for tacit knowledge construction occur in different interactive spheres and spaces (Venkatesh & Ma, 2021). Primarily it is an internal interactive process where the external environment shapes meanings and values unique to each student. Therefore, the environment that supports meta-learning and meta-cognitive processes through self-reflection and learning awareness leads to self-discovery. Empowering students to personalise their learning develops intrinsic motivation and makes them proactive in their learning. It develops their attitude and mindset as lifelong learners, promoting intellectual growth.

The learning community of the classroom nurtures tacit knowledge construction. Trust is an important factor in building learning communities. While it means teachers relinquish their authoritative stance and facilitate sharing of learning responsibilities, it also means they need strategies to resolve conflicts and emotional upheavals in group learning. Establishing connections, especially after the COVID pandemic, is vital to build interpersonal relationships in the classroom. Technology plays an important role in improving communication skills and extending learning beyond the classroom. Furthermore, as IB students engage in community projects as part of their Diploma curriculum, they leverage the tacit knowledge of members of the wider community through hands-on activities and meaningful dialogue.

Table 1 summarizes guidelines for IB teachers to facilitate tacit knowledge construction in the interactive environment of the classroom.

<b>Attributes of tacit knowledge construction</b>	<b>Method of Facilitation</b>
Tacit knowledge construction is a continuous process of development and transformation.	A multidimensional IB interactive experience.
Students' tacit knowledge develops throughout the iterative design cycle process.	Active engagement in hands-on learning, problem-solving and critical conversations.
Tacit skills aid the learning-to-learn process.	Supporting meta-learning and meta-cognitive processes. Empower students to personalise their learning.

Empathetic skills are honed when seeing the world through others' worldviews.	Facilitate a healthy environment to challenge each other.
The learning community of the classroom nurtures tacit knowledge construction.	Build trust, create a democratic environment, engage in meaningful dialogue, embrace AI.

Table 1: Guidelines for Facilitation of Tacit Knowledge Construction

## Conclusion

This study sheds light on the effect of interactive learning environments on the construction of tacit knowledge among IB secondary school students in Hong Kong. In doing so, it hopes to contribute towards improving students' learning outcomes and offer suggestions for curriculum development and strategies for teaching practices in the IB programme. Furthermore, the framework which will be developed through the empirical study can serve as a guideline to create interactive spaces for tacit knowledge construction.

Since this is an ongoing study, the size and selection of participants may seem limited. Due to lack of time and resources, it was not possible to observe all design classes in the IB programme. Further data by studying other IB schools can provide comparative analyses and enrich the research outcomes. Subsequently, the designed framework could be tested in other IB curricula through an intervention research design.

Tacit knowledge deserves a prominent position in education as it has the potential to "transform students into efficient learners and harness their capabilities as future innovators" (Venkatesh, 2021, p. 298). Moreover, tacit skills are not only lifelong learning skills, but they are the skills that will set students apart from AI-dominated skills in the future. Therefore, the study's implications can be extended to any educational scenario. Finally, the excitement surrounding the explosion of chatbots suggests new frontiers for this research in terms of new interactive spaces in the classroom.

## Acknowledgements

The researchers are sincerely thankful to all the teachers and students from the IB school for their support and participation in this study.

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