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The Impact of the Enhancements made to the IB Primary Years Programme (PYP)

Report to the International Baccalaureate Organisation

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Executive Summary

Introduction

The PYP is a curriculum taught in a wide range of schools across 109 countries of the world. The schools teaching the PYP share the IB philosophy and goal of educating empowered, internationally minded learners, and those learners are diverse.

Enabling every one of this range of children to enjoy a relevant education that develops their own identity and empowers them as inquirers involves a degree of flexibility to allow teachers to personalise the curriculum to student needs. The enhancements to the PYP were planned to ensure that the principles of the Learner Profile and transdisciplinary framework remained at the heart of the curriculum, but that disciplines could be planned and studied in ways most relevant for those learners. The original aims of this project were to:

- Identify IB PYP schools' views and perceptions of the enhanced PYP.
- Investigate the perceived impact of the PYP enhancements on the IB school experience of implementing the PYP programme with specific attention to the transdisciplinary framework.
- Identify potential changes or refinements needed to maximize successful implementation of the programme philosophy and transdisciplinary framework.

The key research questions guiding the project were:

1. How do IB PYP schools and students view the enhancements?
2. What is the perceived impact of the PYP enhancements on the IB school experience of implementing the PYP programme?
3. What changes or refinements are needed to maximize successful implementation of the programme philosophy and transdisciplinary framework?

Methods of Inquiry

The study was planned to include three questionnaires administered over a period of three years and 6-8 case studies, revisited twice over that period. In the event, however, due to the international situation regarding the coronavirus pandemic, it was possible only to administer the initial questionnaire and carry out seven single-visit case studies. This meant that we were unable to fully address all of the research questions set. However, based on the inductive analysis of all the results, the current study provides relevant insights regarding the overall perceptions about the enhancements, and identifies some implications and key themes arising from the research for further considerations within the IB.

Questionnaire

The purpose of the questionnaire was to establish a picture of the views of the various stakeholders at and immediately following the launch of the enhancements to the PYP in October 2018. It was distributed in the Autumn of 2018, and responses received from 1524 individuals, 50% of whom were PYP

generalist or specialist teachers, representing 486 schools. This represents a response rate of 33% of IB PYP schools, broadly representative in terms of IB Region, IB Schools division school type and Language base.

Case studies

The study included seven case studies of authorised PYP schools, spread worldwide and covering schools of a range of sizes. Each case study included interviews with the principal, the PYP Coordinator, class and specialist teachers, Teaching Assistants, parents and older students.

Literature review main outcomes

Curriculum and curriculum change

- A curriculum needs to be developed through social understanding in a quest to provide educational goals which promote maximum personal development for pupils.
- Effecting curriculum change will not by any means be a simple process. Neither teacher enthusiasm/skill, nor the effectiveness of the innovation are sufficient to sustain it. There need also to be changes in organizational structure, rules, and procedures as well as top-down support to help counter threats that could de-stabilize an innovation.
- Essential conditions for the sustainability of an innovation are teacher and pupil support for the innovation, teacher perceived value of the innovation, teacher professional development, and leadership approval.

Inquiry-based learning

- The PYP is a curriculum whose distinctive characteristic is its engagement of pupils in inquiry-based learning, a key element of the Approaches to Teaching - which underpin IB education more broadly. Recent research findings in the learning sciences suggest the effectiveness of a constructivist, inquiry-orientated view of learning.
- Contemporary inquiry-based methods involve high levels of scaffolding for pupil learning, meaning the question is not so much whether inquiry-based learning per se is useful, but rather in what conditions can inquiry-based learning be most effective.
- Co-operative learning has been shown to evoke clear positive effects on three principal categories of outcomes: student achievement, attitudes and perceptions.
- Much of the power of an inquiry-based approach to teaching and learning lies in its potential to increase student engagement and deepen understanding through developing a collaborative approach to learning.

Knowledge-based curricula

- A typology of curricula divides them into programmes which privilege either the acquisition of subject knowledge, the development of competencies and skills, or pupil-led learning.
- Some countries, including the UK and the USA, have given the promotion of knowledge a key role in their curricula.
- Critics have argued that it is not 'knowing' facts that is important for students, but also understanding the significance of these facts.
- It is a mistake to assume that a knowledge-based curriculum can only be taught using a traditional pedagogy.

Curriculum integration

- There are three possible orientations to the integration of curricula: Multidisciplinary, Interdisciplinary and Transdisciplinary. The IB PYP is specifically described as transdisciplinary “to convey learning that has relevance across the subject areas and more importantly, learning that transcends the confines of the subject areas to connect to what is real in the world” (IBO, 2010, p.1).

The importance of agency

- Human beings develop knowledge and meaning in their minds not just because somebody implants that knowledge or meaning, but because they actively construct it.
- Human agency is the potential of people to act upon their world purposefully, in situations where it is possible to take different courses of action. Learners need therefore to be seen as decision-makers rather than just repositories of knowledge.
- Research has examined efforts to increase student voice and agency at the classroom level and found that students improved academically when teachers ran their classrooms in ways that valued student voice.

Professional development

- Teachers’ professional development needs to include opportunities for teachers to focus on subject matter that includes hands-on practice which can be integrated into their daily classroom teaching.
- Three classes of professional development involve transmission models (e.g. training and cascade approaches), transformational models (e.g. coaching & mentoring), models focused on professional autonomy (e.g. action research).
- Institutions naturally have a strong interest in developing the skills of their teachers, but they can only achieve this by working WITH these teachers in their development.

Key themes arising

Outcomes from the sources of evidence that we used in this project did overlap to a degree. We carried out an inductive analysis of all the results, which suggested a number of key themes.

Curriculum change and teacher development

Teachers are a crucial factor in educational change. Essential conditions for the sustainability of an innovation appear to be teacher support for the innovation, teachers’ perceptions of the value of the innovation, teacher professional development, and leadership approval. The evidence from the questionnaire suggested that a surprisingly high percentage of the respondents felt completely informed about the enhancements to the PYP. All the teachers interviewed during the case studies expressed some awareness of the enhancements to the PYP but there was, probably inevitably, a knowledge gradient from PYP coordinators to teachers in most of the cases.

Respondents generally agreed that the enhancements to the PYP would make it **better for students, easier to implement, and more flexible for schools.**

Making the PYP easier to implement effectively is a hallmark of the enhancements. The flexibility at the heart of the changes was very much

welcomed, partly as a way of mitigating the challenges all schools faced in various ways of balancing IB requirements with local or national imperatives.

Enablers of change

Approaches to curriculum change may be top-down, bottom up, or process models. The snapshot of change in this project shows features of all three approaches.

Curriculum changes demand high quality professional development for teachers and time to integrate new knowledge and skills into their curricula. The IB's training for schools and teachers had included sharing information at conference sessions, specific PD workshops (some online) and regular mailings. Aspects of this are classic top down approaches to professional development. They were cost effective and appreciated by teachers, but limited in the sense that there was a wide variation in the knowledge of teachers between different schools, which planned PD in different ways and offered different opportunities and timescales. The internal knowledge gradient created was also an issue in some schools, where for example, a head teacher felt the school leaders should have been trained first or where teachers were very dependent on their coordinator to lead, plan and manage introduction of changes. In most schools there were also other approaches to PD employed, for example, longer term projects to address flexible learning spaces. These innovations were seen as a product of school-led innovation by the teachers and school leaders.

In addition to either top down or bottom up PD, teachers were engaged in experimentation in some schools. This approach demands a degree of flexibility in the management of curriculum delivery within the school and might not be possible in all schools. It also demands confidence and inquiry on the part of the teachers and some schools promoted this more than others. In one school, a central team of teachers were selected as the 'enhancements steering committee' to lead developments. The teachers involved were extremely well-informed about enhancements and very positive about their potential in their school, not only for its effects on the curriculum, but also because it was promoting their involvement in curriculum change. Having time to collaborate with other teachers in this way was probably the issue most often identified by teachers as necessary for them to implement the enhancements to the PYP.

Barriers to change

Schools were experiencing many barriers to change in terms of curriculum development, for example:

- The competing demands of local as well as IB curricula, especially where local curricula were knowledge based.
- The assessment mechanisms and points imposed on schools by school groups, states, national bodies or schools themselves.
- The support mechanisms within schools, such as the level of resourcing available to teachers. These could either allow teachers to experiment or demand more compliance from them.
- The amount of time for collaboration, which was seen as the most important barrier for many teachers.
- Uncertainty about what success would look like.
- Uncertainty about the timescale for implementation or the expectations presented by the Programme Standards and Practices.

Key features of the PYP

a) The role of formative assessment in inquiry-based learning

The PYP is a curriculum whose distinctive characteristic is its engagement of pupils in inquiry-based learning which situates learning in problem-solving.

Research findings from the literature review suggest that inquiry-based approaches also tend to imply a shift in emphasis from summative to formative assessment. The questionnaire responses showed a broadly positive view of this shift in the enhancements to the PYP. This view was echoed in the case studies where changes to assessment were welcomed by most of the teachers, leaders and coordinators.

It was, however, pointed out by several interviewees in the case study schools that the assessment mechanisms and points imposed on schools by school groups, states, national bodies or schools themselves were sometimes at odds with the formative assessment emphasis.

b) Agency

Human agency is the potential of people to act upon their world purposefully, in situations where it is possible to take different courses of action. A key feature of an IB philosophy, especially crucial in the PYP, is that learners need to be seen as decision-makers rather than just repositories of knowledge. The review of literature outlined research that had examined efforts to increase student voice and agency at the classroom level and found that students improved academically when teachers ran their classrooms in ways that valued student voice.

The concept and implementation of agency in the PYP gave rise, however, to some mixed responses in both the questionnaire and the case studies. The idea of agency was widely welcomed by respondents, yet agency was also identified as a concept causing concern. It was widely described in terms closely resembling the IB's trio of 'voice, choice and ownership' and examples of creating opportunities for student agency were plentiful, including: decision-making about outdoor play equipment; involvement in a 'safety patrol'; charity work through a 'care group'; designing classroom layouts and supporting learners across age groups.

While agency was certainly high on the agenda in schools, it was not seen as a *new* development, but rather as something to build on and grow. It also seemed that the focus on agency had led to some powerful professional learning across schools and these new conversations had also allowed teaching staff to begin to think about and enact principles of agency in low-risk ways. It seems, therefore, that while the re-positioning of agency may not yet have led directly to substantial changes in *practice* at the time of the questionnaire and interviews, this enhancement had done something potentially more powerful. It had focused teaching staff on agency at a metacognitive level.

Despite the universal enthusiasm for agency as a central guiding principle, there was also some acknowledgment of the constraints. For example, the demands at classroom level of maintaining purposeful direction while relinquishing some control over the students' learning in the name of authenticity.

c) Transdisciplinary learning and teaching

One study of the experiences of PYP teachers as they implemented a transdisciplinary curriculum (Savage and Drake, 2016) found that these teachers tended to view transdisciplinary teaching and learning as a framework within which to work which was flexible and adaptable to different contexts and cultures. This echoes the outcomes of the questionnaire in which increased flexibility was seen as a welcome feature of almost all the PYP enhancements, specifically: in using the planners; flexibility in early years' provision; flexibility in the length and number of units; greater flexibility in teaching both transdisciplinary units and subject courses; flexibility in meeting the demands of local assessments and requirements. In the case studies, flexibility was discussed in a less specific way. Flexibility of unit length and timing was seen as a great advantage by teachers and coordinators and was identified as the most important aspect of flexibility. However, the flexibility to teach outside the transdisciplinary framework was the next most mentioned benefit of flexibility, which can be read as somewhat contradicting the general acceptance of transdisciplinarity.

The schools visited were managing the curriculum through both transdisciplinary units and subject teaching outside the units. Each school took a different approach but all taught mathematics and foreign languages outside the programme of inquiry. Overall, teachers in all the schools viewed the transdisciplinary units as the heart of the students' learning and aimed to maximise links and connections even where 'subject teaching' took place.

Additional curriculum content or assessment requirements placed on schools by local curricula or assessment regimes were one reason for choosing to teach some aspects of the curriculum outside a transdisciplinary unit. In some cases, this was because a knowledge based local curriculum was being adapted to fit into an IB philosophy. The choice to teach particular subjects discretely was also based on pedagogical issues such as timetabling, use of specialist teachers and local conventions regarding their use, or pedagogical differences between the approaches to teaching employed in some subjects.

Most teachers were enthusiastic about the perceived freedom offered by the enhancements in terms of teaching subjects outside of the programme of inquiry. Others welcomed particular enhancements which made the transdisciplinary units more flexible, notably the option to vary the length of units and cover units in innovative ways. Not every teacher reacted positively, however, and some aspects of the enhancements were considered a threat to the transdisciplinary framework. Their concerns were around the flexibility to teach outside the framework, the use of specialist teachers and whether flexibility might weaken the integrity of the framework.

Implications and recommendations

We believe that there are some implications arising from the research, notwithstanding the fact that the project was severely curtailed from its originally planned length and scope. This curtailment, in fact, forms the basis of our final recommendation.

1. In the literature review, we referred to the "enacted curriculum", which arises from teachers' interpretation of the intended curriculum as spelt out

in official curriculum documents. In the project, we have explored these enactments, but of necessity have been limited to studying how teachers perceived the curriculum they had been asked to adopt. For a fuller picture of curriculum change in this context, research would need to focus on classroom action (rather than simply perceptions of and plans for classroom action) and also on student activity and perception.

2. The curriculum change we were asked to explore is based upon a top-down model of curriculum development, in which the curriculum change originated centrally and then was disseminated outwards. In future curriculum change projects, much more attention needs to be given to “the grassroots model” of curriculum development, with the impetus for change being derived from prior research into the needs of teachers and schools – rather than the change being promulgated *then* its effects researched.
3. We recognise that inquiry-based learning remains at the heart of the IB philosophy, especially in the PYP. It does need to be recognised, however, that a knowledge-based curriculum, which can be seen as its antithesis, does have a considerable momentum and influence upon the national/state curricula in a range of jurisdictions. We recommend that some attention is given to this by the PYP team.
4. The notion of a transdisciplinary curriculum is central to the PYP but, of course, for teachers to successfully teach in such a curriculum will often demand that they have to operate in ways which are at odds with much of their previous experience and training. Teachers often seem to hold multiple educational philosophies, some of which are self-contradictory. Exploration of this phenomenon would be a useful research project for the IBO, the findings of which would benefit not just the IBO but education more generally.
5. It has been suggested that effective professional development which promotes changes in teachers’ classroom practices can only be achieved by these teachers experimenting on practice, rather than simply being told about new practices. This demands a shift from transmission models (training, cascade) of professional development towards models focusing upon coaching/mentoring and communities of practice. IBO’s training for schools and teachers, including sharing information at PD conferences and specific PD workshops (some online) for PYP coordinators and regular mailings has tended to utilise top down approaches, which can, of course, be very cost effective. One of the outcomes, however, was a wide variation in the knowledge of teachers between different schools, and within schools. Our recommendation is that the PYP team needs to a) give some consideration to ways of planning PD using alternative models and b) directly address the training needs of teachers other than PYP co-ordinators.
6. The feature of the enhancements most welcomed by questionnaire respondents and case study interviewees was increased flexibility. Most teachers welcomed specific examples of flexibility, and most were enthusiastic about the perceived freedom offered by the enhancements to the PYP in terms of teaching subjects outside of the programme of inquiry. There were, however, some suggestions that some teachers recognised the problematic nature of flexibility, which inevitably leads to variation and maybe some dilution of the key philosophical principles underpinning the PYP. We recommend that the IBO needs to explore this issue carefully

with teachers, with a view to formulating some precise guidance on the parameters of such flexibility.

7. Agency was frequently the first of the enhancements to be singled out spontaneously by respondents and there was strong support for this emphasis. There was also some acknowledgment of the constraints involved, centred on the demands at classroom level of maintaining purposeful direction while relinquishing some control over the students' learning in the name of authenticity. We recommend that some further work needs to be done with teachers on the concept and implementation of agency in the classroom. It seems that, by and large, teachers do not need convincing that agency is important, but they do need some support in developing practical strategies for incorporating it fully into their teaching.
8. There were a good number of comments expressing concern about the possibility of the Exhibition being reduced in status, not having time to prepare and not reporting the Exhibition. We recommend that the PYP team consider this feedback and either try to dispel the concerns it indicates or work with schools and teachers to clarify the new role of the Exhibition in the PYP.
9. Schools were experiencing several barriers to change in terms of curriculum development, some of which, such as time for collaboration and discussion, are ubiquitous in most curriculum change projects. One barrier mentioned by many participants in this research, however, lay in the competing demands of local as well as IB curricula, especially where local curricula were knowledge based, and in the assessment mechanisms and points imposed on school by school groups, states, national bodies or schools themselves. It would be very helpful for schools to have access to correspondents in the PYP team with whom to talk through these issues.
10. Curriculum change is not a simple, nor a quick, process. Schools and teachers change slowly and in order to capture the efficacy of an attempt at change as extensive as the Enhanced PYP, a more long-term study is essential. We would recommend that, if it is feasible, the IBO needs to return to this research in a year or so, when the world hopefully has returned a more normal state, to evaluate the longer-term effects on schools and curriculum of the changes they have introduced.

Introduction

The Primary Years Programme (PYP) enhancements are the result of a substantial and sustained review of the very successful PYP, which aims to ensure that the PYP continues to meet the needs of the diverse and varied range of IBO schools and equips the students with the future-proof education their parents seek for them (Drake et al 2015). This project aims to evaluate the progress of this major reform through the perceptions and actions of the participants.

The PYP is a curriculum taught in a wide range of schools across 109 countries of the world. The schools teaching the PYP share the IB philosophy and goal of educating empowered, internationally minded learners, and those learners are diverse. Enabling every one of this range of children to enjoy a relevant education that develops their own identity and empowers them as inquirers involves a degree of flexibility to allow teachers to personalise the curriculum to student needs. The enhancements to the PYP aim to ensure that the principles of the Learner Profile and transdisciplinary framework remain at the heart of the curriculum, but that disciplines can be planned and studied in ways most relevant for those learners. The original aims of this project were to:

- Identify IB PYP schools' views and perceptions of the enhanced PYP.
- Investigate the perceived impact of the PYP enhancements on the IB school experience of implementing the PYP programme with specific attention to the transdisciplinary framework.
- Identify potential changes or refinements needed to maximize successful implementation of the programme philosophy and transdisciplinary framework.

The contexts in which IBO PYP schools operate are also very diverse and the enhancements to the PYP aim to enable all schools to teach the PYP more effectively. Whilst many PYP schools teach entirely through the PYP programme, other schools are constrained to participate in local curriculum requirements or assessments or have little control over aspects of their academic year which shape student learning experience and teacher planning. This project aimed to explore how the enhancements to the PYP support schools in addressing the local factors that present challenges, for example, needing to plan some subjects to meet local assessments, arranging the Exhibition to avoid clashes with other assessments, or promoting manageable, shared recording and planning requirements (Kushner et al 2016; Gough et al 2014). The enhancements to the PYP seek to offer greater support for planning and assessment but also flexibility in managing curriculum content so that elements of some disciplines can be addressed outside the inquiry-led learning of the transdisciplinary framework to offer depth and balance - in science teaching, and aspects of technology, for example (Campbell et al 2014).

Research Questions

The project sought to investigate the following issues:

1. How do IB PYP schools and students view the enhancements to the PYP?
 - a. What are school perceptions of the enhancements to the PYP?
 - i. To what extent are PYP schools aware of the PYP enhancements?
 - ii. What are schools' overall satisfaction levels with the enhancements to the PYP so far?
 - iii. Do schools view the changes as supportive of the implementation of the transdisciplinary framework?
 - b. *What are students' perceptions of the enhancements to the PYP?*
 - i. *To what extent are students aware of the PYP enhancements?*
 - ii. *What are students' overall satisfaction levels with those enhancements to the PYP they have encountered?*
 - c. What are the benefits/opportunities and costs/challenges of the PYP enhancements?
2. What is the perceived impact of the PYP enhancements on the IB school experience of implementing the PYP programme?
 - d. To what extent does the enhancements to the PYP address the objectives of the review?
 - i. Do the enhancements to the PYP better address the needs of all students (to better engage in a transdisciplinary curriculum)?
 - ii. Are the enhancements to the PYP easier for teachers to implement?
 - iii. Do the enhancements to the PYP allow for more flexibility for schools?
 - iv. *How have PYP schools and teachers attempted to inform parents and how successful have these been in terms of keeping parents onside with developments?*
 - e. How have changes in the enhancements to the PYP affected planning, teaching and assessment practices, particularly in implementing the transdisciplinary framework?
 - i. For the learner?
 - ii. For learning & teaching?
 - iii. For the learning community?
 - f. Have the changes to the PYP resulted in unanticipated outcomes?
 - g. To what extent do the school perspectives of the enhancements to the PYP change over time?
 - i. To what extent do schools perceive the issues addressed by the enhancements as important?
 - ii. To what extent do schools perceive the enhancements as addressing these issues successfully?
3. What changes or refinements are needed to maximize successful implementation of the programme philosophy and transdisciplinary framework?

- a. How are schools planning to implement and manage their transition to the enhancements to the PYP?
- b. *How do schools involve students in reflections and revisions contributing to the enhancements to the PYP?*
- c. What, if any, activities do schools initiate independently to support their implementation of the enhancements to the PYP?
- d. What additional forms of support, or different ways of assisting schools' adoption of the enhancements to the PYP, would better facilitate programme implementation?

(N.B. Those questions italicised in the above list were research questions added, in consultation with the IBO, by the project team, following the initial list given in the Request for Proposals.)

Literature Review

Introduction

This project is focused on the impact of a major set of curriculum changes within a particular school system and in order to begin our study of this impact, we needed to arrive at some understanding of the meaning of the terms “curriculum” and “curriculum development”, as well as an insight into what research suggests can facilitate (or exacerbate) such curriculum change. Thus, our initial literature review for this project focuses on curriculum and curriculum development. The curriculum refers to the content material of a specific subject which is used as a guide by the teacher to plan lessons for pupils (McIntosh, 2013; Taylor and Sobel, 2001).

Curriculum change clearly does not take place in a vacuum. In this case the context of this project was a major enhancement of the Primary Years Programme (PYP) by the IB. Thus the nature of the intended curriculum change underpinning this enhancement is relevant to our study of its impact. Accordingly, in this literature review we explore the background to four major themes in the enhancements to the PYP. These are: inquiry-based learning, the contested role of inquiry and knowledge in the curriculum, the transdisciplinary framework and the concept of learner agency.

Pupils’ learning is influenced by the curriculum but also by the teacher, the ‘enactor’ of the curriculum. Thus, the professional development of teachers is clearly an important influence on the impact of curriculum change. There is an inter-relationship between curriculum development and teachers’ professional development and this leads us to examine teacher professional development and the means whereby that may be accomplished most effectively. Pring (2011) has emphasized that curriculum development and professional development are integral to each other and that there can be no curriculum development without teacher development. We therefore conclude the literature review by examining conceptualisations and practices in teacher professional development.

What is curriculum?

In order to determine if everyone means the same thing by ‘curriculum’, we need to understand the meaning of this problematic term which, according to Phillipou and Priestley (2019), has suffered from the use of some unhelpful “either-or” arguments, or dichotomies. Phillipou and Priestley (2019) prefer to view “curriculum-making as a complex web of enactments across multi-layered and complex sites in which numerous actors engage and ‘make’ curricula” (217). Historically, curriculum has been defined simply as ‘a course of study in one subject at a school or college’ (McIntosh, 2013).

According to Abbott (2014), the curriculum also refers to the knowledge and skills that students are expected to acquire, including the learning objectives they need to meet. These definitions suggest that even *simple* definitions of ‘curriculum’ are

rather complex as they suggest that more than one meaning is being used, sometimes in the same context.

'Curriculum' can also be explained from different perspectives. Commentators such as Patton and Prince (2018), for example, see their role in studying curriculum as attempting to "deconstruct modern constructions of race, gender, identity, and ethnicity based on Enlightenment notions of reason and to expose the ways that this construction perpetuates unjust power relations and violence against minority people" (94). As part of this deconstruction, Porter (2004) suggested that curriculum comprises the *intended* curriculum, the *enacted* curriculum, the *assessed* curriculum and the *learned* curriculum.

a) The Intended Curriculum

In most systems, the intended curriculum is that which is planned by policy makers and curriculum designers and presented in official documents. It covers what should be taught in lessons, both subject content and skills (Lawton, 2012). It may be supported by a range of documents, including subject syllabi, textbooks and teachers' guides.

Most education systems (governmental or non-governmental) have a form of official curriculum, a defined set of standards which includes the content, attitudes and skills that it is intended students under their jurisdiction will acquire. The intended curriculum is based on the content, themes or skills which make sense to the people who planned the curriculum (Taylor and Sobel, 2001). In terms of the teaching of this curriculum, Priestley and Stavroulou (2018) point out that "The term 'delivery' has become ubiquitous in education; teachers are expected to deliver policy, deliver learning outcomes, deliver curricular entitlements, etc." (153).

Kerr (1968) suggested that the intended curriculum can be seen in a wider sense, in that learning is planned and guided by schools and the teachers within them. Thus, the intended curriculum is also present at the school and classroom level, although schools and teachers have increasingly limited power to control what and how they teach, the methods and strategies they use, how to group the pupils and how to manage the flow of individual or sequences of lessons (Priestley and Stavroulou, 2018). Stenhouse (1989) explicated one concept of the curriculum as an *intention*. This could be a plan with an aspiration to improve education in a centralised school system and to ensure regularity, uniformity and conformity in the curriculum for schools. Intentions do not always materialise, however, and an intended curriculum can mutate into other forms, producing what has been termed the *enacted* curriculum (Porter and Smithson, 2001).

b) The Enacted Curriculum

The enacted curriculum arises from teachers' interpretation of the intended curriculum as spelt out in the official curriculum documents. According to Lawton (2012), time is limited so teachers have to make choices about on what is taught during lessons. Macalister & Nation (2011) view every teacher as a curriculum

designer, constantly having to make decisions about what and when to teach and how to do this. This links to the view of Stenhouse (1989) that a curriculum always starts as a possibility (the intended curriculum) and moves to an experiment (the enacted curriculum). Current thinking about curriculum tends to highlight the complex influences upon what is taught and why (Pugach et al, 2020) with the result that the number of studies of enacted curricula has grown over the past decade. One emerging finding is that teachers tend to be curriculum enactors (or designers) but the ways in which they realise this enactment are not uniform (McDuffie et al, 2018).

c) The Assessed Curriculum

There is a direct link between teaching, learning and assessment as all three necessarily work together. The assessed curriculum comprises what pupils learn in terms of measurable achievement. Formative assessment, it has been suggested (Heritage 2010, Wiliam 2013), is one of the most powerful ways of improving student achievement and is often referred to as 'assessment for learning'. Effective formative assessment takes place when pupils receive feedback which helps them understand what they need to do next in order to improve (Black and William, 1998). Summative assessment usually takes place at the end of a defined unit of learning and gives feedback that sums up the teaching and learning process (Hanna and Dettmer, 2004). It is known as 'assessment of learning' (Harlen, 2007). Teachers may involve pupils in the process of assessment as partners, both sharing the responsibility for learning through peer and self -assessment (Heritage, 2010).

Assessment is key to the learning process, providing the teacher with crucial information about how pupils may best be supported in their learning (Reynolds et al, 2006). Macalister & Nation (2011) suggest that every teacher is a curriculum designer and knows what to assess their pupils on. There is quite a lot of evidence, though, of what has been termed 'the washback effect' (Messick, 1996), that is, how much the use of a test influences teachers and learners to do things they would not otherwise in terms of learning. This effect was first conceptualised in the field of second-language teaching and learning, although there is ample evidence that the curriculum which teachers deliver, and which learners are given the opportunity to learn, is heavily influenced by the content of the assessments linked to an area of learning.

The intended curriculum, enacted curriculum and assessed curriculum can all be seen as parts of the prescriptive curriculum: that is, what *should* happen (Ellis 2004, Glatthorn, 2009). In contrast, the fourth perspective on the curriculum falls under the heading of the descriptive curriculum, since it relates to what learners actually experience in classrooms, which may not be at all what teachers intend them to experience.

d) The Learned Curriculum

The learned curriculum consists of what pupils really learn from their classroom interactions with teachers and other pupils (Deutsch 2004). Glatthorn et al (2009)

stated that much of this learning may in truth be hidden from teachers and/or school managers, being implicit rather than explicitly targeted as desired learning outcomes. This hidden curriculum is an area that educators are naturally curious about and yet curriculum texts and statements, and teacher curriculum planning, often ignore its powerful influence (Ornstein & Hunkins, 2009).

The learned curriculum rests upon the ways in which learners make their own sense of the material intended for them to learn, which may differ radically from learner to learner. As an example of this, Wray and Medwell (2006) cite a case taken from their research involving the teaching activity known internationally as 'shared reading', which involves a teacher sharing the reading of a text (often an enlarged version) with a whole class. The rationale for this activity is that the teacher can model for learners how to read and make sense of a text. In the research study, two 8-year-old pupils had this to say when asked the question, 'How do you feel about reading together with the whole class?'

Pupil 1 (boy): We don't read together as a class. Miss just reads to us from the big book.

Pupil 2 (girl): I like reading with the whole class . . . because it helps me when we come to a word I don't know.

Wray and Medwell (2006) comment upon this:

"Here we have two pupils who have had exactly the same curriculum delivered to them, sitting together in the same room in front of the same teacher. Yet they have each constructed radically different curricula from this experience. We cannot know exactly why this different construction has taken place, but it might be revealing to know that Pupil 1 was part of a small group of disaffected boys in this class who were constantly being admonished to listen by their teacher. Pupil 2 was one of a group of girls rated by their teacher as 'good, attentive pupils'. Group identity may well have played a part in the different constructions being made here." (204)

Students experience the curriculum they construct, rather than that the teacher thinks he/she is delivering. The influences upon these constructions are often referred to as the "hidden" curriculum. Giroux and Penna (1979) have argued that the hidden curriculum includes organizational, social-system and culture variables. Organizational variables include all the decisions made on such things as how the teachers are matched to classes, promotions, retention policies, and the use, or not, of ability grouping (Glatthorn, et al, 2009). Social system variables include the multiple ways in which the school climate affects pupil attitudes and achievement, including pupil-teacher relationships, teacher expectation, etc. Culture variable denote the dominant and subordinate belief systems, values, cognitive structures and meanings. If, as Lawton (2012) suggests, curriculum is a selection from culture, the key question is whose culture.

All these three variables of the hidden curriculum (Giroux and Penna, 1979) can be linked to Stenhouse's argument (1989) that curriculum is the reality of what happens in school. Lawton (2012) points out that sometimes the most important aspects of learning in a school do not actually appear in the intended or enacted curriculum but are what pupils take away with them from their school experience. Zhang and Luo (2016) define the hidden curriculum as "the unwritten, unofficial and often unintended lessons, values and perspectives that students learn in school" (218).

Curriculum Development

Stenhouse (1989) believed that curriculum development evolved from the relationship of two different views of curriculum study. The first view may be described as an intention (in the intended or enacted curriculum) and the second as reality (in the learned or the hidden curriculum). Curriculum does not stay the same, because both these aspects change, and thus curriculum development is essential for an up to date curriculum, relevant to the needs of all stakeholders. DeConick (2008) suggested that it is generally believed that curriculum and curriculum development are the responsibility of governments, administrative bodies and schools. However, more recent thinking has begun to acknowledge the roles of teachers in curriculum development (e.g. Chimbi and Lita, 2019) and indeed of the pupils themselves, not least because pupil learning must inevitably be seen as the end goal (Fish, 1965).

According to Hussain et al (2011), a curriculum needs to be developed through social understanding in a quest to provide educational goals which promote maximum personal development for pupils. It should aim to provide continuity of experiences for effective learning in the classroom and, as Gherardi et al (1998) point out, learning is a cognitive and a social activity. Curriculum development, therefore, must recognise the complexity of what is being developed and the needs of the stakeholders in this process (Lawton, 2012).

Models of Curriculum Development

Lunenberg (2011) defines a model as a collection of interacting parts that will guide actions. Its purposes are to organize our existing knowledge, help us to see new relationships and prevent us being overwhelmed by complexity. There is little doubt that curriculum is complex, more so than what is commonly believed (Kelly, 2010, Ponder 1974). We can identify three models of curriculum development: the top-down model, the bottom-up model and the process model. These models tend to have been conceived as reactions to each other, and it is likely that there are elements of each which will inform curriculum development in current times.

a) A Top- Down Model of Curriculum Development

A top-down model of curriculum development was first outlined by Tyler in 1949 (Tyler, 2013), producing what is generally thought of as the most influential approach (Nunan, 1996). Tyler's objectives-centred model arose firmly from an

administrative and managerial perspective (Glatthorn et al 2009, Pinar et al 2008). Its four basic principles were based on four key questions (Tyler, 2013):

- What educational purposes should the school seek to attain?
- How can learning experiences which are selected be likely to be useful in attaining these objectives?
- How can learning experiences be organised for effective instruction?
- How can the effectiveness of learning experiences be evaluated?

Lawton (2012) simplified Tyler's model to four elements: aims and objectives, content, organization and evaluation. Its four questions serve as principles with an undoubted appeal in terms of rationality (Kelting-Gibson 2013, Glatthorn et al 2012, Ornstein and Hunkins 2009, Pinar et al 2008, Nunan 1996, Print 1988). However, by the 1970s, Tyler's model was strongly challenged during a reconceptualization period (Travers, 1983).

Commentators such as Giroux (1988) and Sears and Marshall (1990) saw Tyler's model as over-simplistic. Nunan (1996) also criticized Tyler's model for its implication that the curriculum development process occurs in a manner which follows discrete sequential stages. According to Kelly (2010), a more realistic approach to planning and developing a curriculum would recognise the importance of the interactions between all elements of the Tyler model.

b) A Bottom-Up Model of Curriculum Development

The American educationalist, Hilda Taba introduced in the 1960s what she termed "the grassroots model" of curriculum development, with the goal of promoting a thoughtful and dynamic approach to curriculum (Hunkins & Hammill, 1994, Taba 1962). The most prominent aspects of this model were its circular processes, with the emergence of new goals arising from the interactions between teachers and pupils (Taba, 1962). It is considered a more grassroots, inductive approach than models such as that of Tyler in that, firstly, it advocated that teachers should design the curriculum, rather than teachers having to follow guidelines produced by higher authorities. Secondly, this design process should start with specifics (such as the needs of particular groups of pupils) and build up to a more general design (Ornstein and Hunkins, 2009). The seven steps in Taba's model were:

- Diagnosis of needs
- Formulation of objectives
- Selection of content
- Organisation of content
- Selection of learning experiences
- Organisation of learning experiences
- Determination of what to evaluate and of the way and means of doing it

Krull (2003) argued that Taba's model was a more flexible form of curriculum renewal and was more likely to be accepted as it explicitly involved the active contribution of teachers themselves. On the other hand, it has been criticised (Horn, 2002) for being too reliant on the participation of teachers, making it unworkable. Kelly (2010) suggested that there are inadequacies in both Tyler's and Taba's

models and that neither offer real assistance with the decision of how to choose the content or the aims of a curriculum. Thus, a more comprehensive model was needed, partially answered by the Stenhouse process model (1989).

c) A Process Model of Curriculum Development

The process model of curriculum eschews the idea of curriculum as a physical thing, but views it rather as the interaction of teachers, students and knowledge.

Curriculum is what actually happens in a classroom and what people do to prepare for and to evaluate this. The process model elaborated by Stenhouse (1975) has had a considerable influence upon research in curriculum development and teacher development (Pinar et al, 2008; James, 2012). Stenhouse (1975) described the curriculum as a recipe in cookery:

"It can be criticized on nutritional or gastronomic grounds – does it nourish the students and does it taste good? – and it can be criticized on the grounds of practicality – we can't get hold of six dozen larks' tongues and the grocer can't find any ground unicorn horn! A curriculum, like the recipe for a dish, is first imagined as a possibility, then the subject of experiment. The recipe offered publicly is in a sense a report on the experiment. Similarly, a curriculum should be grounded in practice. It is an attempt to describe the work observed in classrooms that it is adequately communicated to teachers and others. Finally, within limits, a recipe can vary according to taste. So can a curriculum." (Stenhouse 1975: 4-5)

Stenhouse (1989) claimed that analysing the criteria and structure of teaching/learning activities, will show clearly the principles and procedures of teaching. Each classroom is seen as a laboratory, and each teacher a scientist. Of course, given the uniqueness of each classroom setting, this means that any proposed curriculum, even at school level, needs to be tested, and can be verified only by individual teachers. There can be no curriculum package, designed to be delivered anywhere.

Outcomes are no longer the central and defining feature of curriculum. Rather than the tightly specified behavioural objectives of traditional top-down models of curriculum development ("Pupils will be able to ..."), what happens in this model is that content and methods develop as teachers and students work together. The learners are no longer seen as objects to be acted upon, but instead have a voice in the way that sessions evolve. The focus is on interactions, meaning that attention shifts from teaching to learning, and learning becomes the key concern of the teacher (Grundy, 1987).

The process model's strength is it focuses on knowledge and understanding and is viewed as a process which transforms both teachers and pupils (James, 2012). Nevertheless, it does have a number of possible problems. The first is the lack of uniformity in what is taught. The approach treats learners as subjects rather than objects, and can thus lead to very different methods being employed in classrooms and very different content being taught. There may also be a major weakness

(strength as well, of course) in that the model relies on the quality of teachers. If they are not very capable of teaching in this more open-ended way, then there are no prescribed curriculum materials for them to fall back on. There have been attempts to overcome this by developing materials and curriculum packages which focus on the 'process of discovery' or 'problem-solving', for example in science. But there is a danger here that processes become reduced to sets of skills. When pupils are able to demonstrate certain skills, they are deemed to have completed the process. Whether or not they are able to apply the skills to the world around them is somehow overlooked (Grundy 1987).

Implications

The purpose of elaborating these three, very distinctive, approaches to curriculum and curriculum development has been to underpin a contention that deliberate approaches to curriculum development will be planned and executed very differently, depending upon how the curriculum is theorised. Put simply, these approaches imply different foci for change.

- If curriculum is seen as the 'delivery' of predetermined educational objectives (as in Tyler's top-down model) then change will focus upon a refinement and redirection of these objectives, along with efforts made to develop teachers' abilities to deliver these (a teacher-training model).
- If educational objectives are to be derived from analysis of the needs of particular learners (as in Taba's bottom-up model) then change will need to focus upon developing teachers' skills and approaches to such diagnostic assessment, and upon enabling them to select effectively from a range of possible teaching paths in response to their diagnoses (a teacher-education model).
- If curriculum is seen as dynamic and responsive to the constructions of pupils and teachers (as in Stenhouse's process model) then change will focus upon equipping teachers to manage and use such dynamism in their classrooms, and upon being able to follow the leads of their pupils (a transformation model).

It may well be, of course, that in a particular educational situation, elements of each of these models of curriculum and curriculum development will be at work at the same time. Thus, effecting curriculum change will not by any means be a simple process.

In the following section, we review the current state of thinking about the nature and progress of change in education, focusing especially upon facilitating and inhibiting factors.

Change in Education

As Marzano et al (1995) put it, "One of the constants within education is that someone is always trying to change it" (165). Whether it be a new set of teaching practices, a new curriculum or teaching programme, or a new technique or use of technology, change and development are normal within education, and all of these changes are supposed to be for the better. Yet many apparently powerful innovations are short-lived. Serdyukov (2017) analyses some of the reasons for this lack of impact in the US educational system, based around two key questions: "Why, having so many innovators and organizations

concerned with innovations, does our education system not benefit from them? What interferes with creating and, especially, implementing transformative, life-changing, and much-needed innovations across schools and colleges in this country?" (7). Cuban (2013) has chronicled the fate of a number of educational innovations and even the most visible, such as the embedding of technology into everyday teaching practices, have struggled to make an impact. A crucial question related to the long history of unsuccessful innovations is why, in spite of the goodwill and, often, sound research underpinning them, did they fail?

Researchers and theorists who have studied the change process suggest that the failure of many innovations may be due not to their inherent weaknesses but to the basic nature of the change process. The success, or otherwise, of innovations in education can be affected by a number of influences at three levels (Kozma, 2003). First is the micro level - factors such as classroom organization and personal characteristics of teachers and pupils. Such day to day influences can determine whether or not a proposed innovation is adopted, is practices and is successful. As Fullan (2001) has argued, teachers are the crucial factor in educational change, as they are people with their own views as to what is possible and desirable in classrooms and not automata who simply do what they are told by those in authority over them.

Above this is the meso level, including the school organization and personal characteristics of school leaders. At the meso-level, it has been powerfully argued (Fullan, 2001; Van Den Akker, Keursten, & Plomp, 1992) that innovation benefits from strong leadership and a supportive organisational environment. Hence, successful innovative practices are likely to be those supported by the school management, which fit in the current curriculum, and can readily become part of a teacher's routine. School improvement studies emphasize the central role of context and school culture in change (Fuller & Clarke, 1994; Stoll & Fink, 1996; Faddar et al, 2018). Parental involvement also seems to be especially critical to ensuring success where parents and teachers work together while recognizing the complementary role they play in the children's lives (Fullan, 2001). There is evidence that children whose parents are involved in their schooling tend to perform better (Desforges & Abouchar, 2003; Lehrl et al, 2019).

Third is the macro level, which concerns national policies and international trends. Although there is often a gap between national policies and the classroom practices they are intended to influence, such a gap is less likely when there is coherence between curriculum, assessment, teaching materials, and teaching guidance (Cohen & Hill, 2001).

Beyond the national or provincial level, current theories of comparative education (Arnove, 2013) have identified a tension between the global forces that affect social relations and institutions across national boundaries and the effects of these forces which are determined by local cultural, political, and historical factors. Thus, the international pressures to increase educational quality and efficiency have been shown to have different effects in different parts of the world (Yamada, 2015). These global forces are modified and, in some cases, even transformed as they are reshaped to meet local demands.

All innovations are affected by this extended set of personal, pedagogical, curricular, and organizational factors (Lockton and Fargason, 2019; Salomon, 1991; Kozma, 1994). According to Kozma (2003) causality among these factors

does not always operate in one direction. Classroom practices are affected by school organization and broader policies, but school organization and broader policies can also be influenced by successful classroom innovations.

Sustainability of educational change

Even though many innovations do have an effect upon classroom practice, very rarely is this effect a permanent one. Very few innovations become institutionalized, that is, a regular part of accepted school/classroom practice (Datnow, Hubbard, & Mehan, 2002; Elmore, 1996; Cuban, 1992). Miles (1983) advanced an influential, three-part explanation of how innovations become institutionalized.

- Institutionalization begins with administrative commitment, which Miles views as a necessary but not sufficient condition for it to happen.
- The administration then puts pressure on teachers to implement the innovation and assistance in mastering it.
- Through their hard work, teachers eventually become committed to the innovation which, in turn, leads to “stabilization of use” and, ultimately, institutionalization.

Miles makes the point that neither teacher enthusiasm/skill, nor the effectiveness of the innovation are sufficient to sustain it. There need also to be changes in organizational structure, rules, and procedures as well as top-down support to help counter threats that could de-stabilize an innovation. Most commentators see this as a recursive process in that decisions taken at any one phase can feed back to alter decisions made at previous and subsequent phases (Fullan, 2001).

A great deal of research effort has been devoted to the examination of factors which either contribute to or work against the institutionalisation of educational innovations (e.g. Lockton and Fargason, 2019; Bridwell-Mitchell and Sherer, 2017). Datnow, Hubbard, and Mehan (2002) classified factors inhibiting the success of this process into three categories: agency, culture, and structure.

- Agency factors include the decisions and subsequent actions of teachers who do NOT implement reforms in the way that was intended (Bridwell-Mitchell, 2015), or the decisions of curriculum designers who are not sensitive to local circumstances.
- Cultural explanations include the ways in which innovations are affected by being introduced into new school settings: schools can change the reform as much as the reform changes schools.
- Structural factors include the ways in which national or district policies or programs interact with and affect local school reforms.

Overall, it does seem that the further an innovation is from the normal practices in a school, the lower the likelihood that it will have a sustained effect.

Conditions for Sustainable Innovation

Owston (2007) has suggested a model of sustainability of curriculum and pedagogic change, largely supported by existing research. This outlines a set of conditions deemed necessary, but not sufficient, for innovations to be sustained. These are, according to Owston (2007):

- Teacher support, without which the innovation simply does not happen. Innovation leaders often assume that teacher support will be forthcoming simply because they themselves are convinced of the value of an innovation, or they can argue that it is supported by research. This is a risky assumption. Teachers themselves need to believe that what they are doing in the classroom is valuable before they commit their wholehearted support to it. Teacher agency is important here and it can lead to teachers' active support, rejection or passive acceptance of changes (Datnow et al. 2002). This agency is, however, bound up with the context in which teachers operate (Lasky 2005; Priestley et al. 2012).
- Teacher skills, which may need to be developed in order that they can operate in new ways in the classroom. Thus, teacher professional development is at the heart of sustaining an innovation. There is a considerable literature exploring effective professional development, which we will review in a subsequent section.
- School leadership support. As we outlined earlier, there is considerable literature (e.g. Fullan, 2001; Van Den Akker, Keursten, & Plomp, 1992) supporting the notion that innovations are likely to be more effective and sustainable when members of the school management are clearly in favour of them. This, at the least, ensures that school organisational features will tend to be ameliorated to allow an innovation to become part of classroom routines.
- The support of pupils. Pupils are clearly the reason why schools exist, yet the perceptions of these key stakeholders have been relatively ignored in the literature on curriculum change. Yet it is clear from several case studies of change in schools that pupil enthusiasm for a new way of working in classrooms can be a major impetus towards the sustainability of such changes. There is clearly a place for what Cook-Sather (20) has termed "authorizing students' perspectives" in developing and promoting successful classroom change.

Summary

Curriculum and pedagogic innovation are shaped by the complex interaction between the innovations themselves and contextual factors such as school policy, leadership, cultural values, teacher attitudes and skills, and pupil perceptions and characteristics. Essential conditions for the sustainability of an innovation appear to be teacher and pupil support for the innovation, teacher perceived value of the innovation, teacher professional development, and leadership approval.

The PYP curriculum is complex with its roots in a set of particular values and beliefs about learning. In the following section of this literature review we will explore the research behind some of the key issues relevant to the PYP and its enhancements. We will examine particularly the contested nature of inquiry-based learning and its corollary, a skills and values focused curriculum, before going on to look critically at what may seem its antithesis, a knowledge-based curriculum. We will go on to examine the nature of transdisciplinary learning, and the concept of learner agency. These concepts are fundamental to the philosophy of the PYP and to the enhancements being made to it.

Inquiry-based learning

The PYP is a curriculum whose distinctive characteristic is its engagement of pupils in inquiry-based learning which situates learning in problem-solving or investigations of complex phenomena. Inquiry-based learning is multiply defined (Alfieri et al, 2011), but here we mean learning where pupils conduct investigations related to one or more research questions, set by either pupil or teacher. The term "inquiry" as a search term in the online literature yields publications related to primary and secondary education and there is some overlap with the term "problem-based" in the HE literature. The notion of "inquiry" is central to the pedagogical approach and curricula articulated in the IB programmes, based on a conviction that human learning is at its most effective when it arises as the result of genuine questions on the part of the learner, although this philosophy has not always been at the heart of popular pedagogical approaches. A rather different model of education was typical of many 20th century classrooms – namely, the teacher was the repository of all the knowledge that learners would need on any given topic; the teacher's responsibility was to pass on as much of that knowledge as possible to the pupils; pupils would then be tested/examined on what they could remember of this knowledge. This model of education may have been effective for an era of human history in which the knowledge base needed to function effectively in society was relatively limited and static, but the "knowledge society" that we now live in requires new thinking about what constitutes effective and engaging teaching and learning (Cho et al., 2015). We would also argue that, especially in the context of the rapid growth of international schools, contemporary education demands an international perspective. Teachers are now faced with the challenge that "former conceptions of knowledge, minds and learning no longer serve a world where what we know is less important than what we are able to do with knowledge in different contexts" (Friesen, 2009, p. 3).

Inquiry or direct instruction

Recent research findings in the learning sciences suggest the effectiveness of a constructivist, inquiry-orientated view of learning, though the research tends to be concentrated on the learning of STEM subjects. Furtak et al. (2012), for example, conducted a meta-analysis of science learning and found that pupils who did inquiry with "minimal guidance" from their teacher learned more than children exposed to "traditional teaching" techniques. Alfieri et al. (2011) conducted a similar meta-analysis across subjects and found that, although inquiry-based learning with no instruction was less effective than direct instruction, when pupils received adequate guidance during inquiry, they learnt more. Moreover, although the ability to inquire does develop with age, children as young as five years old could generate simple hypotheses, undertake experimentation and evaluate evidence - and so were able to conduct inquiry. Zimmerman (2007) summarises the research in this area by concluding that children are far more competent than first suspected, and adults less so. This places the teacher in a very important position in inquiry-based learning, which tends to be seen as a pupil-led approach.

Not surprisingly, then, controversy about inquiry-based learning in the literature has focused on levels of instruction and the pupil role in learning. Kirschner et al. (2006) launched an attack upon constructivist approaches to teaching and learning in science and what they term "minimal guidance". However, Hmelo-silver et al. (2007) argued that contemporary inquiry-based methods involve

high levels of scaffolding for pupil learning, effecting a shift from whether inquiry-based learning per se is useful to an exploration of the conditions in which inquiry-based learning can be most effective. This has sparked a range of studies into guidance levels in classrooms, culminating in the meta-analysis by Lazonder and Harmsen (2016) of studies of the effects of guidance in inquiry-based learning. They drew upon studies (and other meta-analyses) from STEM domains and all age groups. They designed a new six level typology of inquiry-based learning guidance, from process constraints, which are the least specific guidance and restrict the scope of the task, to explanations, the most specific guidance, which specify how to perform an action. This typology can be seen below.

Typology of inquiry learning guidance (Lazonder and Harmsen, 2016, 689)

Type of support	Basic idea	Intended audience
Process constraints	Restrict the comprehensiveness of the learning task	Learners who are able to perform and regulate the basic inquiry process, but still lack the experience to do so under more demanding circumstances
Status overviews	Make task progress or learning visible	Learners who are able to perform the basic inquiry process, but lack the skills to plan and keep track of their learning trajectory
Prompts	Remind to perform an action	Learners who are able to perform an action but may not do so on their own initiative
Heuristics	Remind to perform an action and suggest how to perform that action	Learners who do not know exactly when and how an action should be performed
Scaffolds	Explain or take over the more demanding parts of an action	Learners who do not have the proficiency to perform an action themselves or cannot perform the action from memory
Explanations	Specify exactly how to perform an action	Learners who are (largely) incognizant of the action and how it should be performed

The meta-analysis showed that guidance is helpful in inquiry-based learning, both in short inquiries, such as a single lesson, and longer inquiry projects. Adequate guidance is not the same as very specific guidance and too much specificity can challenge the inquiry nature of the task. However, if teachers want students to maximise their performance (not necessarily their learning) such as in making a presentation to parents, then highly specific guidance is probably necessary. The meta-analysis found that young children do not

necessarily benefit from more specific guidance than older children but that that the frequency of guidance of all sorts was important in improving outcomes. The way that guidance is used through a longer project is an important issue - and the orchestration of guidance, by teachers and pupils, merits further study. The research suggests that such a range of tasks will need a range of types of teacher support.

These findings do shed new light on the conditions of effective minimally guided teaching approaches such as inquiry-based and problem-based learning. Underlying Kirschner et al.'s (2006) plea for high instructional guidance was the tacit assumption that more specific guidance would lead to greater learning. Kirschner et al. advocated the use of worked examples and process worksheets as effective methods of guided learning, both of which have been successfully used to facilitate inquiry-based learning (e.g., De Vries et al., 2008; Mulder, Lazonder, & De Jong, 2014). The results of the meta-analyses confirm that even though worked examples and process worksheets differ in specificity—they would be classified as explanations and heuristics, respectively—both would have similar positive effects on learning and performance. This suggests that “strong guidance” does not necessarily mean “specific guidance”; other dimensions such as the frequency and duration of the guidance might be more important.

Collaborative inquiry

The PYP is intended to give pupils the opportunity to develop both individual and group skills and, as such, ways of working are of as much interest as the outcomes of working.

Both co-operative and collaborative learning focus on peer interaction and the promotion of social skills within groups and the terms are often used interchangeably. One of the major results of research into learning in schools during past decades is that co-operative learning has been shown to evoke clear positive effects on three principal categories of outcomes: achievement, attitudes and perceptions (Kyndt et al., 2013).

Johnson et al (1981) produced the first meta-analysis examining 122 studies on the effects of cooperative, competitive, and individualistic classwork on pupils' achievement. The results showed that cooperation was more effective than competition, and these results were consistent across all subject areas, for all age groups, and for all tasks involving conceptual understanding, problem solving, categorizing, and reasoning. In a later study, Slavin (1989) reported on a best-evidence synthesis of 60 studies that compared cooperative learning to control groups studying the same material and showed that the overall effects of cooperative learning on achievement were clearly positive in 72% of the comparisons. These findings led Slavin to conclude that cooperative learning can be an effective strategy for increasing pupil achievement. In a follow-up meta-analysis of 117 studies, Johnson and Johnson (2002) examined the effects of cooperative, competitive, and individualistic learning on a number of academic, personal and social dependent variables (e.g. achievement and self-esteem) and found strong effect sizes from cooperative learning in comparison to competitive and individualistic learning. It seems fairly well established therefore that cooperative learning in comparison to competitive and individualistic learning has very strong beneficial effects on such pupil outcomes as achievement, socialization, motivation, and personal self-development. Roseth, et al (2008)

went on to examine the processes through which these benefits are derived. In a further meta-analysis of 148 studies comparing the effectiveness of cooperative, competitive, and individualistic approaches, Roseth et al. found that higher achievement and more positive peer relationships tended to be found in cooperative rather than competitive or individualistic approaches. In the words of Roseth et al, "the more teachers structure pupils' academic goals cooperatively, (a) the more pupils will tend to achieve, (b) the more positive pupils' relationships will tend to be, and (c) the more higher levels of achievement will be associated with more positive peer relationships" (Roseth et al., p. 238). Johnson, et al (2014) went on to find that situations characterized by positive interdependence resulted in greater motivation and achievement than did negative or no interdependence situations. Similarly, Slavin, et al (2014) claimed that: "science teaching methods focused on enhancing teachers' classroom instruction throughout the year, such as cooperative learning and science-reading integration, as well as approaches that give teachers technology tools to enhance instruction, have significant potential to improve science learning" (p. 901). In short, there is overwhelming evidence that cooperative learning as a pedagogical practice has a profound effect on pupil learning and socialisation (Slavin, 2014).

Nevertheless, simply placing pupils in groups and expecting them to work together will not necessarily promote cooperation. Group members often struggle with what to do and disagreements can occur as pupils grapple with the demands of the task as well as with managing the processes involved in learning, such as dealing with conflicting opinions among the group or with pupils who contribute little to the group's goals. To avoid these problems, Johnson and Johnson (2009) proposed that groups need to be established so that the five key components of successful cooperative learning are embedded in their ways of working (Gillies, 2016). These components were:

Positive Interdependence	All group members understand that they are linked together in such a way that one cannot achieve success unless they all do, and they must join their efforts to ensure that this happens.
Individual Accountability	Group members understand that they need as individuals to complete their share of the work while also making sure that others do likewise.
Promotive Interaction	All group members are willing to help each other to complete their tasks so that the group can achieve its goals. Members help each other as needed, share needed resources, provide effective feedback to other members – all with the aim of producing better shared outcomes.
Interpersonal and Small Group Social Skills	Group members need to learn not only the content material but also interpersonal and small group skills, for example, leadership, decision-making, communication, and conflict management. These are complex skills and require teaching. In a series of studies, Gillies (2003a, 2003b, 2004, 2006, 2008) found consistently that pupils who were trained to help each other were more

	considerate of each other's contributions and provided more detailed explanations to help each other's learning.
Group Processing	After completing their task, group members need time to reflect on how well their learning groups worked, in terms of their outcomes and their group working processes.

Much of the power of an inquiry-based approach to teaching and learning lies in its potential to increase student engagement and deepen understanding through developing a collaborative approach to learning. The aim is that IB pupils learn to use this approach in order to develop as knowledgeable inquirers, thinkers and risk takers. An approach through inquiry recognises the complex, interconnected nature of knowledge construction, and provides opportunities for both teachers and pupils to collaboratively build, test and reflect on their learning (Lüddecke, 2015).

There have been a number of attempts across the world to embed a more inquiry-led approach into mainstream education. Harste (1990) stressed the link between inquiry and modern iterations of literacy, while Wray (1999) and Perkins (2010) emphasised the importance of inquiry as underpinning a distinctive pedagogy across the entire curriculum. It would be fair to say, however, that these attempts have not met with a great deal of success. Many jurisdictions appear to have retreated during this early part of the 21st century to a reductionist model of a knowledge-centred curriculum, drawing inspiration from such theorists as Hirsch (1987), whose "cultural literacy" approach is centred around a centralised definition of what counts as knowledge for pupils, rather than a more organic conception of knowledge led by pupil interest. The IB programmes represent one of the few, current, centrally-sanctioned attempts to put pupil inquiry at the heart of the teaching-learning process, yet the questions raised by the idea of a knowledge-based curriculum do need to be addressed. How can schools and teachers ensure that students emerge with the crucial knowledge which underpins their cultures? How can students be effectively inducted into the 'powerful knowledge' (Young and Muller, 2013) which defines the subjects they study at school and beyond?

Inquiry or knowledge-based curriculum?

Manyukhina and Wyse (2019) suggest a typology of curricula in which organisations/jurisdictions are seen to privilege one particular approach to teaching and learning. The three curriculum 'types' they examine are:

- a knowledge-based curriculum, in which the acquisition of subject knowledge represents the main learning activity and intended outcome
- a skills-oriented curriculum, which extends the focus of learning to include other curriculum elements, such as competencies and skills, whilst maintaining the emphasis on an in-depth study of subject content
- a learner-centred curriculum, which prioritises pupil-driven learning over subject learning with the aim of ensuring the holistic development of pupils.

Applying this typology to an analysis of the curriculum documentation emanating from Australia, Canada (Ontario), Hong Kong and England, Manyukhina and Wyse (2019) found that the only curriculum from these four which could be described as knowledge-based was that of England. Had the USA Core

Curriculum been studied in the same way, it is likely that it could have been added as an example of a knowledge-based curriculum. It seems that, while there may at the moment be a majority of jurisdictions around the world favouring curricula based upon pupils learning skills and being involved in inquiry (Lyakhova et al, 2019), a significant number of (English-speaking) countries have moved towards a curriculum focused on the teaching of defined knowledge, or facts.

This is somewhat surprising, given the historical child-centredness of the English education system and the individualised-learning archetype of American schooling. A quotation much employed by commentators on English education stated that "Education is not the filling of a pail but the lighting of a fire" (this was commonly attributed to William Butler Yeats - apparently mistakenly <https://www.irishtimes.com/news/education/education-is-not-the-filling-of-a-pail-but-the-lighting-of-a-fire-it-s-an-inspiring-quote-but-did-wb-yeats-say-it-1.1560192>). The highly influential pre-war Hadow report into the primary curriculum in England and Wales gave us another quote which used to appear in almost every book or report on the curriculum in the United Kingdom - 'the curriculum of the primary school is to be thought of in terms of activity and experience rather than knowledge to be acquired and facts to be stored'. (Board of Education, 1931, Section 75). The implication was clear: teachers had more important things to do than simply fill children's heads with facts. Yet knowledge has returned in force as the driver of the curricula in England and in the USA. The rationale for this needs to be examined, not least because the concept of a knowledge-based curriculum is a central challenge to inquiry-led approaches.

The rationale for a knowledge-based curriculum

The promotion of knowledge to such a key role in the achievement of desirable education outcomes is associated with the work of E. D. Hirsch, of the University of Virginia. His seminal 1987 book, "Cultural Literacy: What Every American Needs to Know" made a huge impression, at least in the USA when it first appeared. In that and subsequent outputs, Hirsch makes the case that schools must teach a common, shared body of knowledge across the curriculum to build vocabulary, raise verbal competence, and serve the cause of social and economic justice. In 1986, he established the Core Knowledge Foundation in the USA to create curriculum materials built upon his work and insights. This foundation supported a growing network of Core Knowledge schools, committed to teaching the Core Knowledge Sequence, a detailed outline of content in language and literature, history and geography, mathematics, science, music, and the arts. It was highly influential in the establishment of the Common Core State Standards in 2009 (<http://www.corestandards.org/>) – the nearest that federal USA has ever come to a national curriculum. Although in these Standards, decisions about what knowledge content should be taught were left to authorities at the state and local levels, it was made very clear that the standards required that students should systematically acquire knowledge in literature and other disciplines through reading, writing, speaking, and listening.

In England, the 2009 Independent Review of the Primary Curriculum (Rose, 2009) recommended essentially a skills progression in primary schools. A national election in 2010 led to this curriculum not being implemented and, instead, in 2013, the new National Curriculum for primary schools had this to say:

"The national curriculum provides pupils with an introduction to the essential knowledge that they need to be educated citizens. It introduces pupils to the best that has been thought and said; and helps engender an appreciation of human creativity and achievement" (Department for Education, 2013, 6).

(The phrase "the best that has been thought or said" is important in the UK context, being a direct quote from Matthew Arnold (1869), a headteacher and inspector of schools in England before becoming Professor of Poetry at Oxford University and a hugely influential education commentator).

This reworking of the curriculum in England explicitly drew upon the ideas of Hirsch. It was also underpinned by the arguments of British sociologist, Michael Young. In a series of books and papers (e.g. Young and Muller, 2013; Young, 2013; Young and Lambert, 2014) Young has outlined the importance of what he refers to as 'powerful knowledge'. He sees this as specialized knowledge in that it draws upon the work of communities of specialists that are generally described as disciplines. These are primarily forms of social organization whose main *raison d'être* is to produce new knowledge. Specialist forms of knowledge differ in their structures and the aspects of the world they reference. Obvious distinctions are between the sciences, the social sciences, and the humanities, each being the basis of core subjects in the school curriculum. Different subjects offer students different kinds of power. For example, the sciences generate the power of abstraction and generalization; the social sciences provide weaker generalisation, but do provide new ways of imagining how people and institutions behave. The humanities do not provide the bases for generalization but they can show, through literature in various media, how the particular, a character for example in a great play or story, can represent something about humanity in general. Powerful knowledge for Young, therefore, is knowledge which empowers its knowers to go beyond their immediate situations in order to understand and imagine the more general. Haynes (2018) sets out three features that make this knowledge distinctive:

- It is distinct from the 'common-sense' knowledge that we acquire through our everyday experience. Common-sense knowledge develops in our daily lives, and is therefore tied to specific contexts.
- Powerful knowledge is 'systematic', in that it is based on concepts that are related to each other in groups we call disciplines, rather than rooted in real-life experience. This is important as it means that powerful knowledge can be used to make generalisations beyond our own experience.
- Powerful knowledge is specialised as it is developed by experts in clearly defined subject groups who work within fields of inquiry with socially and historically fixed boundaries.

Hirsch's fundamental case for a knowledge-based curriculum rests upon his contention that skills such as critical thinking, problem solving, and, especially, reading comprehension are not content-neutral, transferable skills that can be taught, practised, and mastered in the abstract. Once students can decode text fluently, their ability to comprehend a reading passage is largely a function of making correct inferences, a process that depends heavily on the background knowledge and vocabulary shared between author and reader. Unlike throwing a ball or riding a bicycle, Hirsch argues, reading comprehension is not a transferable skill that can be applied to any text. There is an extensive research base underpinning this essential argument, which shows that "poor" readers are

often more effective than “good” readers when reading about topics that they know a lot about and where good readers lack the same knowledge. In a study by Recht and Leslie (1988), a group of junior high school students—one half identified by standardized tests as “good” readers and the other half as “poor” readers—were asked to read a passage about a baseball game. The “poor” readers with deep background knowledge of baseball scored much more highly on a test of their comprehension than the good readers with low levels of knowledge, effectively demonstrating the enabling role of background knowledge in reading with understanding. This connection between content knowledge and cognition is at the heart of Hirsch’s work and is essential to understanding his insistence on teaching a shared body of common content from the earliest days of school. He frequently invokes Stanovich’s (1986) term, the “Matthew Effect,” to describe the process by which students increase—or do not increase—their vocabulary, reading comprehension, and other cognitive processes. The name comes from a passage in the Book of Matthew in the Bible: “For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath.” “Those who are language-poor in early childhood get relatively poorer, and fall further behind, while the verbally rich get richer,” Hirsch observes (Hirsch, 2011). Thus, he sees the achievement gap as a knowledge gap—if we want students to read with understanding, then we need to develop their stores of knowledge across a wide variety of domains.

This proposition, implemented in Core Knowledge schools across the USA, has also been extensively tested by research studies, some of which have focused on quite young children. Sonnenschein, Baker and Garrett (2005), for example, report the results of an evaluation of the effects of being taught using the Core Knowledge Preschool Sequence on 4 year olds in 10 Baltimore preschool centres during 2004-2005. Results showed that children receiving the Core Knowledge Preschool Sequence programme made significant and moderate to moderately strong increases in performance from pre-test to post-test, as measured by a standardised test of student achievement. Bradley (2005) reports on a similar study in the state of Arkansas. The purpose was to evaluate whether participation in the Core Knowledge Preschool program had resulted in improved readiness for school in a group of 4 year olds. Results suggested that participation in Core Knowledge had a significant impact on student achievement. There were significant improvements in all areas of academic functioning, greater than would have been predicted from national norms.

Other studies have focused on older children. Wedman and Waigandt (2004) used national test score data from 22 Core Knowledge schools across 13 states to identify trends in student performance. The Core Knowledge school students performed well above the national average. This increase was evident across all content areas and across schools of different sizes, and different socio-economic and ethnic backgrounds. MacIver, Stringfield and McHugh (2000) report similarly positive outcomes from a five-year longitudinal study of Core Knowledge schools in the state of Maryland.

Contrary voices

Hirsch’s ideas have not been universally accepted, even in England and the USA, where they have had most impact upon educational practice. Over the years, critics have frequently attacked Hirsch’s concept of cultural literacy as “aimed at preserving the intellectual domination of white Anglo-Saxon males, and as a

means of boring children with mindless drills and stuffing them with 'mere facts'." (Hirsch, 2006, 6). This criticism may well have been true in the case of Hirsch's first book (Cultural Literacy, 1987), in which the entire second half is taken up with long lists referred to as "What Literate Americans Know", but in reality lists of what Hirsch himself knew and thought essential for everyone else. Since that initial definitional attempt, the process of establishing Core Knowledge topics became a good deal more rigorous, involving some lengthy research and consensus-building among subject specialists and educationalists, including representatives of a range of cultural groups. Nevertheless, this work was of necessity done within an American context and "What Literate Americans Know" is clearly not the same as "What Literate Britons Know", or Thais, or Mexicans, etc, etc. It is not, of course, the idea that the precise details of Hirsch's analysis should be imposed upon other countries/cultures/contexts, but rather the principle of building a curriculum around knowledge, as opposed to 'skills'.

A further, common criticism of the Hirsch approach has been that knowledge-based curricula, being content-heavy, risk learning descending to a fairly low form of rote learning, as students struggle to commit the knowledge they are taught to memory. Kidd (2018) has argued that it is not 'knowing' facts that is important for students, but also understanding the significance of these facts and the ways in which they resonate with other topics and, perhaps, subject areas. As Kidd puts it:

"I don't just want children to be able to identify the location of Hadrian's wall on a map, to be able to recount who built it and why and to be able to map out the layout of the barracks. I want them to know that there were black skinned soldiers there who had marched from as far as Syria."

To be fair, rote learning would not be a goal valued by Hirsch or other advocates of a knowledge-rich curriculum. Rather they would value the ability to apply and use knowledge to assist a range of cognitive activities. Yet they would insist, as argued by Willingham (2006), that knowledge, rather than generic 'thinking skills', underpins a range of thought processes. Some research supporting this comes from the meta-analysis carried out by Taconis et al (2001) who evaluated studies of ways to improve students' scientific problem-solving skills. It seemed that the successful interventions were those that were designed to improve students' knowledge bases. Especially effective were those in which students were asked to integrate and relate different concepts by, for example, drawing a concept map or comparing different problems. Interventions designed specifically to improve the students' scientific problem-solving strategies had little or no impact.

One critique of a knowledge-based approach to curriculum has been made by Twining (2018), who argues that his observations of UK schools that follow this approach have been characterised by certain approaches to pedagogy, for example:

- a focus on content that had to be covered (learnt)
- traditional, teacher focused pedagogy (as evidenced for example by the organisation of desks in the classroom so that all the children are facing the teacher 'at the front')
- the teacher (and teacher selected resources) being the only valid sources of expertise (as evidenced for example by most of the permitted talk being by the teacher or between the teacher and individual children)

- a lack of digital technology use by children - even where mobile devices are present children predominantly write on paper

Twining claims that this focus on a knowledge-based curriculum, which lends itself to traditional teacher focused pedagogical practices, reflects the 'new' National Curriculum for England (2013).

It is likely here, though, that Twining and other similar critics are making the mistake of assuming that a knowledge-based curriculum can only be taught using a traditional pedagogy. This confusion between what is taught and how it is taught is not uncommon in the debate about a knowledge-based curriculum. It is perfectly feasible to teach agreed bodies of knowledge through more inquiry-led approaches. This demands a fairly high level of skills from the teacher in terms of curriculum negotiation.

Willingham (2002) argues that "knowledge seems to be the unavoidable foundation of expertise, including that part of expertise that enables individuals to solve novel problems by applying existing knowledge to new situations—sometimes known popularly as 'problem-solving' skills." This is a view of curriculum that sees knowledge and skills as working in tandem, rather than being opposing learning goals.

A transdisciplinary curriculum

Definitions

The IB (2008) document "*Primary Years Programme: Developing a transdisciplinary programme of inquiry*" describes the development of transdisciplinarity as it underpins the PYP curriculum, beginning with the work of Boyer (1995) who proposed a curriculum through which students explored a set of themes that represent "shared human experiences". This work led to the selection of the six transdisciplinary themes:

- Who we are
- Where we are in place and time
- How we express ourselves
- How the world works
- How we organize ourselves
- Sharing the planet

These themes lead to the units of inquiry around which the PYP is structured.

Definitions of the concept of transdisciplinarity have been thoroughly discussed in the work of curriculum theorists and teachers. This approach to curriculum clearly fits into the notion of 'integrated curriculum', characterized by Drake and Reid (2010) as "increasing relevance while maintaining accountability" (1). One of the earliest presentations of the distinctions between a multidisciplinary, an interdisciplinary and a transdisciplinary curriculum can be found in Grady (1994). She states that "A final distinction in this continuum of interdisciplinarity is that of a transdisciplinary approach. It goes beyond the mastery of aspects of a single discipline or multiple disciplines, blurring the boundaries between disciplines and is the most complex to design, develop and carry out, particularly in a traditional setting" (4). Davies et al (2011) include transdisciplinarity as one of their "Ten skills for the future workforce", and define it simply as "literacy in and ability to understand concepts across multiple disciplines" (11). They elaborate this into "transdisciplinarity goes beyond

bringing together researchers from different disciplines to work in multidisciplinary teams. It means educating researchers who can speak languages of multiple disciplines—biologists who have understanding of mathematics, mathematicians who understand biology.” (11). Drake et al (2015) also point out that: “Educators define integrated approaches in a wide variety of ways such as cross-disciplinary, intradisciplinary, fusion, multidisciplinary, interdisciplinary, transdisciplinary or integrated; implementation of integrated curriculum can look significantly different from one unique educational setting to another.” Building upon Drake’s earlier work (e.g. Drake, 1993) we can discern three possible orientations to the integration of curricula.

- **Multidisciplinary:** This approach is subject-centred, although the work is orientated around a central theme. Learning is organised within subject areas, preserving disciplinary integrity, and the links between the subjects are not necessarily stressed by teachers.
- **Interdisciplinary:** Subjects are still clearly apparent, but now the organising central ideas are found in the interdisciplinary key concepts, skills and attitudes which are stressed. It may not be completely clear which subject is actually being taught at any given point.
- **Transdisciplinary:** Transdisciplinary means going beyond disciplines and the organizing idea in this approach is found in the problem or issue which students are studying. Students’ questions, rather than those developed by a teacher, are the key starting point for study in which subjects might be present but do not take precedence.

The IB PYP is specifically described as transdisciplinary “to convey learning that has relevance across the subject areas and more importantly, learning that transcends the confines of the subject areas to connect to what is real in the world” (IBO, 2010, 1). Paige et al (2008) identify the crucial feature of a transdisciplinary curriculum as being issues-based, and they point to the problems caused by trying to view problematic issues from single disciplinary viewpoints. Transdisciplinary approaches are seen as avoiding subject compartmentalization in the curriculum, yet they do in themselves create problems for teachers.

Transdisciplinarity in action

Although teacher commentators such as Carrillo (2018) have enthusiastically described the ways in which transdisciplinarity has enabled the students in her school to learn “at a deeper level”, the difficulties of implementing such an approach should not be underestimated. The commentary by Higbea (2017), while somewhat ‘tongue in cheek’ as a critique of transdisciplinary learning (the author clearly being an enthusiast) does nevertheless point to some issues with the approach from teachers’ perspectives. For teachers to successfully teach in a way which is almost certain to be at odds with much of their previous experience and training may demand a significant realignment of their core beliefs about teaching and learning. The study by Levin and Nevo (2009) suggests a complex picture in terms of these beliefs. They found that a group of teachers who experienced the teaching of a transdisciplinary curriculum did not change their beliefs about teaching and learning in a consistent, predictable way. Indeed, these teachers appeared to move towards holding multiple views, some of which were self-contradictory. The simultaneous holding of “compound educational beliefs concerning learning and teaching” (Levin and Nevo, 2009, 461) suggests

that teachers may be more adaptable to different teaching approaches than may be thought.

Evaluations of the approach

Research evaluations of transdisciplinary approaches to student learning tend so far to have been focused upon higher education contexts. Park and Son (2010), for example, report an evaluation of an undergraduate course (*Creative Industries: Making Connections*) in which 1200 students from a range of disciplines studied ways to communicate effectively through a range of types of media. Student responses to this course suggested they found the transdisciplinary nature of their learning to be very helpful in connecting the course content to their interests and possible future employment.

At a school level, a research review produced by the Michigan Department of Education (2014) summarised the benefits of integrated curricula, some of which are described below:

- Coherent Concept Development. Research suggests that integrated curricula tend to result in greater coherence in learning and to encourage more elaborated concept development in students (Hartzler, 2000). Integration encourages interconnectedness in learning at all levels and works against the over-simplification that knowledge can be boxed into “subjects” (Drake 2007).
- Depth of Knowledge. Integration results in deeper learning and improved problem-solving, especially when what is required is the application of knowledge to new contexts (Wiggins and McTighe, 2005). It also appears to enhance the skills of critical thinking (Furco, 2010).
- Enhanced student motivation. Because curriculum integration tends to involve students to a greater extent in their learning, it usually results in enhanced motivation (Guthrie, Klauda, and Ho, 2013).
- Enhanced Sense of Community. Collaboration with other students and with the teacher tends to be more extensive as integrated curriculum units are planned and executed collaboratively.
- Overall Achievement. Hartzler’s (2000) meta-analysis of 30 studies of integrated curriculum classrooms showed a high overall effect size for increasing achievement. Many research studies have shown similar achievement outcomes (e.g. Blair, 2009; Catterall et al., 2012; Cervetti, Pearson, Barber, Hiebert, and Bravo, 2007) which equal or exceed the outcomes of students in subject-based programmes.

In an IBO-commissioned study of the experiences of PYP teachers as they implemented a transdisciplinary curriculum, Savage and Drake (2016) found a generally positive response. The teachers they studied:

- Tended to view transdisciplinary teaching and learning as a framework within which to work which was flexible and adaptable to different contexts and cultures.
- Found it most helpful when the transdisciplinary framework they used included a curriculum planning tool focused on backwards design principles with rich performance assessment tasks.
- Had time to meet with each other to plan the work, and not only at the beginning of a year or term.
- Needed large blocks of time during the school day to be devoted to transdisciplinary teaching and learning as opposed to strict timetabling.

- Needed everyone, including school management as well as teaching colleagues, to 'buy in' to the program.
- Required a good professional development programme to offer training on how to implement transdisciplinary teaching and learning.

Learner agency

Human beings develop knowledge and meaning in their minds not just because somebody implants that knowledge or meaning, but because they actively construct it. Coming to know and understand something is an active process relying on the way the mind brings together previous knowledge and new information. Humans can be described as negotiating meaning rather than simply receiving it. In support of such a theory of meaning-creation is the fact that there is absolutely no guarantee that, given access to exactly the same information, two or more learners will take away exactly the same meanings. This negotiation process requires us to see the human mind in a particular way - a way that can be described as agentive. An agentive mind is 'proactive, problem-orientated, attentionally focused, selective, constructional and directed to ends' (Bruner, 1996, p. 93). Human agency is the potential of people to act upon their world purposefully, in situations where it is possible to take different courses of action. Seeing the human mind in this way suggests that we need to think of learners as decision-makers rather than just repositories of knowledge.

The concept of agency in learning is not a new one, although it has sometimes gone 'against the grain' of dominant theoretical explanations of learning. A behaviourist view of learning, for example, had little to say about agency of either the learner or of others who influenced the experience of the learner. Indeed, Skinner (1961) strongly rejected and opposed any notion of human will.

The concept of agency, and its role in learning, came to prominence due to the learning theories of Piaget and his concept of constructivism where knowledge is seen as "constructed" through a process of taking actions in one's environment and making adjustments to existing knowledge structures based on the outcome of those actions. The implication was that "the most transformative learning experiences will be those that are directed by the learner's own endeavours and curiosities." (Lindgren & McDaniel, 2012. 346)

Having agency as a learner is now an expectation rather than a hope, especially among adolescents who have become increasingly competent at using a variety of technologies to access and contribute to the learning that meets their needs. (21st Century Learning Reference Group, 2014)

So what is learner agency? Bray (2017) lists a set of key characteristics of learners who have this sense of agency. Learners with agency:

- Know how they learn best.
- Are proactive in their learning.
- Set goals and action steps for college, career, and life.
- Develop learning strategies and skills to support meeting the action steps.
- Select appropriate tools and resources for each task and are "Future Ready."
- Develop curiosity to learn about the world.
- Self-direct and monitor their progress in learning.
- Reflect on evidence of their learning.
- Identify their passion and purpose for learning.

- Foster an authentic and meaningful life.

A very useful framework to conceptualise learner agency is that provided by the Griptape organisation (Griptape, 2017), described as “a research-based roadmap to facilitate and measure the development of learner agency with the goal of inspiring every young person to accelerate and deepen their learning” (1). This framework is centred around four inter-related component groups, namely: Learner Internal Locus (an individual’s belief in their ability to exercise control over their learning and desire to do so); Learner Skills (what a person must gain competence in to effectively guide their learning); Learner Experience (experiences perceived as valuable by the learner in order to help foster agency); Learner Environment (the external context surrounding the learner). 15 sub-components are then defined, as shown in the table below:

Components	Definition
Learner Internal Locus	
Mindsets	Belief in one’s ability and competence, coupled with the conviction that we can all get better and grow.
Passion	Strong interest in a topic displayed over a sustained period of time that can progress from interest or curiosity to passion.
Learner Skills	
Forethought	Ability to set and inform an intention that will guide action plans and strategies.
Goal-Setting	Ability to set goals and anticipate likely outcomes.
Self-Regulation	Ability to construct and follow through on an appropriate course of action, and correct as needed.
Self-Reflection	Ability to reflect on one’s thoughts, actions, and experiences and learn from them.
Learner Experience	
Pursuit of Competence	Opportunities to learn through experiences that lead to greater levels of competence and confidence.
Decision-Making	Opportunities to exercise autonomous decision-making over the learning process, experience, and outcomes.
Collaborative	Learning is interactive and reciprocal, with all involved learning from each other, sharing ideas, and co-constructing the learning.
Purposeful	Learning experience is interpreted and perceived by the learner to be relevant and meaningful.

Learner Environment	
Recognition	External recognition of learning, including listening and responding.
Youth-Adult Partnerships	Presence of adult role models and champions, who believe in their own agency and engage in equitable, respectful, trusting, and reciprocal relationships.
Near-Peers	Presence of near-peers (youth 2–3 years older or with greater expertise) as mentors, champions, and role models who can inspire, support, and help learning feel relevant.
Peers	Connection to peers who contribute, share, and give feedback in social experiences that are fluid, engaging, and supportive.
Resources	Access to the resources needed to carry out learning meaningfully.

Notwithstanding the attractiveness of such 'listing characteristics' approaches, Biesta and Tedder (2007) suggest that agency should not be understood in this way, in terms of an individual's capacity. Agency is, rather, something that needs to be achieved in particular contexts. It is not so much something that learners have, but something they do, being therefore more a 'quality' of the ways in which learners engage with material in contexts.

Lewis and Moje (2003) similarly describe agency as the power to control how one's self, identity, relationships, and activities are made and remade on a daily basis. According to Lewis, Enciso and Moje (2007) learning is a social process and learner agency is determined by the nature of social participation in classrooms.

Such a 'situated' perspective on agency is highlighted in the IBO list of what learners with agency are doing (IBO, 2017):

<i>What is the Learner doing?</i>
Learners:
<ul style="list-style-type: none"> are actively engaged in various stages of learning, including: thinking about, planning, modifying and creating
<ul style="list-style-type: none"> are actively involved in discussion, questioning and by being self-directed in their creating (as opposed to passive receiving)
<ul style="list-style-type: none"> apply their understanding of concepts through the construction of their projects/play
<ul style="list-style-type: none"> make connections to the real world by taking past experiences into their play worlds
<ul style="list-style-type: none"> have an active voice and stake in the classroom/community
<ul style="list-style-type: none"> face challenges and are given the freedom to independently overcome these or fail through trial and error or experimentation
<ul style="list-style-type: none"> are risk-takers
<ul style="list-style-type: none"> express their theories of the world and these are honoured in the environment
<ul style="list-style-type: none"> reflect on their actions and self-regulate.

There is a distinct overlap between learner agency and learner metacognition. "Metacognition is knowing about and having control over cognitive processes" (Eggen & Kauchak, 2013, p. 268). The concept of metacognition includes what

learners know and believe about their own thought processes (metacognitive knowledge), and their abilities to regulate those processes (metacognitive regulation). These are recognised as vital skills for children and adults (Flavell 1979; Fitzsimons and Finkel 2011), although the extent to which they are at play in young children has only been recognised quite recently (Whitebread et al., 2007; 2009). It is the idea of self-regulated learning which corresponds most closely to learner agency. Weibell (2011) has suggested that such self-regulated learning includes the following processes (pp. 355-356):

Process	Self-regulated learners:
1. Goal-setting.	- know what they want to achieve when they study.
2. Planning.	- plan how best to use the time and resources they have available for learning.
3. Attention control.	- try to focus their attention on the subject matter at hand and to clear their minds of potential distractions.
4. Application of learning strategies.	- choose different learning strategies depending on their learning goals.
5. Self-motivational strategies.	- keep themselves on task with a variety of strategies, such as competing against their own previous performances.
6. Solicitation of outside help when needed.	- do not necessarily try to do everything on their own.
7. Self-monitoring.	- continually monitor their progress toward their goals, and change their approaches if necessary.
8. Self-evaluation.	- determine whether what they have learned meets the goals they set for themselves.
9. Intrinsic motivation.	- are intrinsically motivated to study the material they have chosen.

Learning to use these strategies may, as Ferguson et al, (2015) suggest, be as important an outcome of schooling as basic skills. If students have the ability to act purposefully with regard to their learning (agentively) they are less likely to be merely passive participants in their learning and in their lives.

Manyukhina and Wyse (2019) concur with this view and suggest that “the key orientation of the school curriculum should be to enhance children’s capacity to utilise their agentic resources, both with respect to their own life courses and within a society. A focus on agency is crucial not only for personal empowerment and enhancement of students, but also for the wider social, political, and economic purposes.” (238).

Research has examined efforts to increase student voice and agency at the classroom level. Most studies have found that students improved academically

when teachers ran their classrooms in ways that valued student voice (e.g. Mitra, 2004; Rudduck & Flutter, 2000), although these tend to have been studies based in secondary classrooms.

Research has also demonstrated the importance of encouraging students to take control of their own learning, although again, this research tends to have involved adolescents rather than primary-age students. Toshalis and Nakkula (2012) have summarised this research and claim that:

"Student-centered classrooms that capitalize on the power of self-determination can substantially increase achievement and motivation. Promoting student voice also has been linked to other important educational outcomes, including: elevated achievement in marginalized student populations; greater classroom participation; enhanced school reform efforts; better self-reflection and preparation for improvement in struggling students; and decreased behavior problems."

Bokas and Rock (2015) discuss some of the ways in which schools can empower their students to help them feel in control of their lives. They ask teachers to "intentionally design experiences, environments, and interactions that foster the discovery and development of the self". Some of these ways are:

- Incorporate Unstructured Play. Play can allow children to develop social skills, use their imaginations, and learn about themselves. It also appears to support children in developing the self-regulation which Bandura (1991) argued was so important. Self-regulation leads to self-efficacy – the belief that they are capable of doing an activity – which in turn is essential for the development of personal agency.
- Increase Time on the Arts. Creative expression, the making of an object, can give children a feeling that they can achieve something. They therefore will benefit from experiences such as painting a mural, composing a song or performing a poem. Art involves an act of creation that gives people a sense of agency—the experience that they can change the physical world and the world of those around them.
- Provide Opportunities for Making and Tinkering. Blum-Ross et al (2010) have explored the ways in which learners use spaces in which they can explore construction possibilities (Makerspaces). In such spaces they can become active participants in creating their own knowledge, building their agency along with their models.
- Encourage Thinking and Questioning. Learners can take a more active role in learning and focus on their thinking, while reflecting upon questions. When children pose questions and evaluate the answers, they are likely to feel more in charge of their learning.
- Involve Students in Projects. Authentic learning environments can help connect student learning to the real world which is an effective tool to build a sense of agency.

Hempel-Jorgensen (2015) reports on the outcomes of a study of learner agency in disadvantaged urban primary schools. She used a framework developed by Bernstein (2000) to distinguish between schools using either:

- 'performative' pedagogies, characterised by a focus on assessment using tests, and on discipline, in which student success was measured through their outcomes.

- 'competence' pedagogies, characterised by a focus on students as individual people and on a low focus on discipline or testing, relying heavily on student self-regulation.

Her findings suggest that learner agency was enabled and hindered in complex ways, although there were some clear relationships between learner agency and pedagogy. For example, in the competence-based classrooms, talk between students and with their teachers was much less regulated and more encouraged than in the performative classrooms, where it tended to be teacher-led. Students in the competence-based classrooms tended to take more initiatives in their learning, and they were more likely to feel trusted by their teachers to engage with this learning.

Summary

The concept of learner agency carries the implication that learners need to interact actively with their environments and be actively involved in their learning and development (Haste, 2001). Learners are seen as agents who have a say in constructing the conditions of their own learning, wherever this occurs (Schoon, 2018). Agency takes us beyond a view of human behaviour as simply the result of external pressures (in the way that Skinner and the behaviourists conceived it), and towards an ideal involving self-determination. This does not mean that behaviour is unconstrained by external pressures, rather, it is part of a broader social context not totally controlled by the individual. Agency, therefore, has to co-exist with key structures such as the expectations of schooling. This has given rise to such modified concepts as 'structured' or 'bounded' agency (Shanahan, 2000; Evans, 2002), that is, agency within limits. Individual learners are not, however, totally bound by such limits. Their actions can affect the contexts in which they learn. As Schoon (2018) has argued, school learners, like everyone else, are producers as well as products of their social world.

Teacher Professional Development

According to one international survey of teaching and learning (Pedder and Opfer, 2013) teachers' professional development in many countries did not actually meet the needs of teachers. Although teachers' professional development is recognised as dynamic and continuous throughout a teacher's career, one of its problems seems to lie in the gap between the professional development on offer and demands of the classroom and context of learning (Pedder and Opfer, 2013). Bolam et al (2005) suggested professional development needed to encompass a wide range of activities and be set in relevant contexts of professional activities in order for it to be effective, and may involve teachers learning in collaboration.

Research has also highlighted the fact that effective professional development which promotes changes in teachers' classroom practices can only be achieved by these teachers experimenting on practice, rather than simply being told about new practices (Pedder and Opfer, 2013). Day and Leitch (2007) have argued that professional development should include opportunities for teachers to focus on subject matter that includes hands-on practice which can be integrated into their daily classroom teaching.

Enhancing Teacher Quality

Research into the school related factors impinging upon pupil achievement strongly suggests that the teacher's role is crucial (Hargreaves and Fullan, 2012, and Wiliam, 2013). The success of pupils in their academic achievement is based on the school's capacity to meet their specific educational needs (Mincu, 2013). In schools and classrooms where taught pupil groups tend to be mixed ability, personalisation is important (Mincu, 2013). One size does not, obviously, fit all, and so there is a need for skilful teachers who are able to cope with the demands of such complex classrooms. In addition, Pring (2011) emphasized that teachers are central to the creation and assessment of the curriculum. The development and enactment of the curriculum goes hand in hand with teacher development.

Many policies have been designed and implemented to promote teacher quality, from initial teacher preparation to our current concern of professional development for teachers who are already teaching in schools. Enhancing teacher quality is a key step towards school reform and it is linked to the quality of continuing teacher education programmes (OECD, 2012). It appears to be the case that not all schools, especially disadvantaged schools, have the highest quality teachers, thus policies, from international to local, have the aim of raising teacher quality and tend to try to meet this through the provision of targeted professional development to provide teachers with the necessary skills (OECD, 2012). Professional development will also include the provision of mentoring programmes through which teachers collaborate and share their skills (Joyce and Showers, 2002). Career incentives are usually also given to attract and retain high quality teachers (OECD, 2012).

Teachers' professional development does impact upon pupils' achievement although it is difficult to identify the exact factors that influence the improvement and how much they contribute (Thompson, 2003). Nevertheless, professional development that is effective in enhancing the quality of teachers is embedded both in the analysis of pupils' achievement and in the expressed needs of teachers (Darling-Hammond, 1997), even though, according to Zepeda (2012), it is difficult to separate teachers' professionalism, teacher quality and pupils' achievement.

Professional Development for Teachers

According to Wiles (2009), one crucial aspect of curriculum development is curriculum improvement involving staff development. In-service education and training (INSET) of teachers connects curriculum and instruction (Gandara et al, 2005). The goal is to improve teaching and learning and provide teachers with a better understanding of their role and of the material they are teaching, to share better teaching tools and new skills so they can be more effective teachers and facilitate better learning among pupils (Wiles, 2009; Ho et al, 2001).

The role of the teacher has come under scrutiny in recent years (Hargreaves and Fullan, 2012), which has led to an urgent demand for teachers of higher quality in the classroom (Haycock, 1998). Day (1999) has suggested that the quality of teaching will depend on teachers' professional development and their willingness to continue to learn. Furthermore, there are changes in the expectations of teachers due to the changing contexts of schools and to changing pupil attitudes (Day, 1999). Zepeda (2012) suggested, however, that professional development should not be seen as an intervention to address perceived weaknesses in

teachers' competencies but should instead be a proactive process, enabling teacher development to lead curriculum development rather than simply follow it. The following section will look at the different models of professional development and its complexities.

A Definition of Professional Development

Professional development (PD) is a term used to include the broad range of activities that teachers can engage in to further their learning after they have completed their initial training and have become practicing teachers (Craft, 1996). Neil and Morgan (2005) highlighted that PD can mean different things to different people. Their definition of professional development covers several areas: the development that teachers select and pursue for their own purposes, the development organised by the school in order to implement their policies effectively, the development provided nationally or internationally to help teachers implement official policies. Day (1999) defined PD as all the natural learning experiences and the consciously planned activities which benefit individual teachers, their students and the school in terms of enhancing the quality of education in classrooms. PD can also be defined by the distinction made by Bolam (1993) between professional training, professional education and professional support. Professional training includes subject based training delivered to support strategies to teach a subject. It also includes training in management-based activities. Professional education covers longer award bearing programmes such as diploma and higher degree awards. Non-award bearing practitioner research, reflective practice, non-award bearing courses and conferences also come under this category. Professional support comes in the form of formal and informal support from colleagues as well as support from consultants. Teachers' PD is ideally a process which empowers them to take control of their own learning and development. Teachers' need for new knowledge, skills and experiences positions PD as an intervention that assists their development (Megginson & Whitaker, 2008).

Reasons for Professional Development

There are many reasons for teachers to go through PD. These include improving job performance skills, career development, increasing professional knowledge, preparing for changes in educational policies and increasing job satisfaction through individual growth (Craft, 1996). The ultimate goal of PD is therefore to help teachers move forward, not least in terms of helping them to be ready for new situations with their pupils in schools and in society. Pupils' achievement tends to be the primary focus of teachers' PD and learning (Zepeda, 2012), although, oddly, pupil achievement has rarely been used as an overt measure of the effectiveness of such development.

PD is also used in a narrower way with reference to professional teacher courses (Craft, 1996) with the goal that teachers should be able to gain additional recognition and qualifications as well as develop specialized skills or talents (Eraut, 1987). Such courses are planned to raise the professional standards of teachers and strengthen the teaching force in terms of creativity and responsiveness to innovation. According to OECD (2012), teachers are at the heart of the educational process and have a great responsibility for pupils' education. The nature of their job demands high quality teachers that engage in continuing PD throughout their careers, even though, as Day (1999) pointed

out, most PD programmes are designed to address short-term problem focused curriculum goals.

Models of Professional Development

Kennedy (2005) has enumerated three classes of PD, encompassing nine models as follows:

- transmission models
 - training
 - cascade
 - award-bearing
 - deficit
- transformational models
 - coaching & mentoring
 - standards-based
 - community of practice
- models focused on professional autonomy
 - action research
 - transformative

The most widely used of these models have been the cascade model, the training model and the coaching and mentoring model (Kennedy, 2005), and in the remainder of this review we will focus upon an exploration of the strengths and weaknesses of these three.

The Cascade Model

Wedell (2005) stressed that PD via a cascade is aimed to be a cost-effective means of bringing educational change to a large population of teachers. It involves several processes. It begins with teachers being selected as individuals from schools or institutions to attend training sessions. After they have completed the training or course, they have to disseminate and share the information, knowledge and skills they have acquired to other teachers in their schools or districts. Thus the knowledge and insights gained by one group are cascaded to another.

The cascade model is used in contexts where there are limited resources, such as a lack of skilled trainers (Kennedy, 2005), or school systems in which funding direct training for all but a few teachers is financially prohibitive (Karalis, 2016). The major expense is often at the beginning of the process, where an expert trainer or a small team of trainers are employed to train a large group of teachers. The first pool of teachers will then go on to train another group, which may be in their own schools or districts. Members of this second cohort may be further used to train other teachers, and so on in a linking chain. Logically there is no limit to the number of groups trained by those trained in each link. However, the norm tends to be three to four links down the cascade chain. In theory, the quality of content which is passed down from the first group to the last group should be similar because the training is often delivered using the same package of materials (McDevitt, 1998; Wedell, 2005). The principle is to create groups of experts at each level.

Strengths and Criticisms of the Cascade Model

One of the greatest strengths of the cascade model is the way in which teachers who have experienced the first level of training then go on to become trainers in their schools, and local areas (McDevitt, 1998). This gives them a dual role as a participant first and then a trainer (Wedell, 2005), in other words providing them with two opportunities to learn the material.

This could, however, also be a problem if the transition periods given to the teachers are very short, should they need to become 'active' facilitators right after completing the initial training (McDevitt, 1998). In terms of practicality, they would actually need time to understand the ideas and key concepts and do further exploration of the content area before being able to train others.

Wedell (2005) further explains that the 'dual' role given to the teachers is similar to that of expert coaches (Joyce & Showers, 2002). This is true especially for teachers who serve as trainers to do smaller scale training programmes in district or state levels. Nevertheless, Showers & Joyce (1996) argued that these trainers or expert coaches would still need some form of active coaching before they would be fully ready to conduct training.

The cascade model's strength is in the fact that it can produce a great many teachers as possible with hands-on experience of the proposed content, skills and teaching techniques in quite a short period of time (Hayes, 2000). Thus, it is an economical way of getting the training done with less materials and less master trainers. In most cases, preparation will include one module or package and a small group of skilled trainers to train the first group.

The main criticism of the cascade model, nevertheless, is that it follows a top-down model, making it difficult to make changes once it is set in motion (McDevitt, 1998). Even if a trainer notices flaws in the training content and wants to make changes after the first training, the first link is already over and subsequent teachers will simply follow what they have experienced in their own training when training the next cohort. It will be impossible for them to get feedback from the trainer if there are suggested revisions.

Another major weakness of the cascade model is that the audience is constantly changing from one level to the next (McDevitt, 1998). This makes it difficult to tailor one package of training to fit the needs of the teachers at all levels (Dichaba & Mokhele, 2012). Planners would face a tension over who to target in designing their initial training package - educators at the top of the pyramid such as heads of departments or novice teachers. These distinct audiences need different sets of materials and maybe different content if the initial training is to be totally successful.

One of the criticisms of the cascade model is that ideas may get distorted if they are not clearly understood by the first group of teachers being trained. There is also a risk that the first group may alter the content, or adapt it, before delivering it to another group in the next link. They may modify or select specific content they want to use and leave out critical areas originally included by the programme developer. Thus the cascade model's provision of training is not a guarantee that the training aims will be applied in all classrooms (Wedell, 2005). The content may be diluted as it is passed down along the different links and levels of teachers (Turner et al. 2017). Additionally, Dichiba and Mokhele (2012) found that, in their setting, although the cascade model was an accepted method and was popularly used for the training of teachers, it did not lead to

improvements in the performance of teachers in the classroom. Gonzalez (2007) suggested that this was because the cascade was likely to have been reduced to a trickle by the time it reached the teacher in the classroom.

The cascade model has its strengths and is still widely used and preferred in many countries especially in the developing world (Dichiba and Mokhele, 2012). It may be useful as a training model but partly fails to disseminate information and ideas or changing behaviour patterns along the different levels and links (McDevitt, 1998). It is also not sufficiently flexible to respond to challenges from the grassroots level and to the changing needs of pupils (Prophet, 1995).

The Training Model

The training model is the dominant form of PD widely used to train and re-train teachers almost universally (Kelly & McDiarmid, 2002). Its aim is to provide teachers with the opportunity to upgrade their knowledge and skills and become more competent teachers. The training is often planned and conducted by a trainer who is seen as an expert (Kennedy, 2005). The training can take place at the teachers' school or institution as well as at an off-site location, which is centralized. This model is often labelled as a top-down delivery model of PD which focuses on direct teaching. Information is passed down from trainers to teachers and they are expected to implement this in their teaching. The method reinforces the idea that teachers are implementers of externally imposed policies (Rose & Reynolds, 2007).

Lieberman (1996) classified PD into three types: direct teaching, learning in school and out of the school learning. Training would fit under direct teaching where teachers attend courses, workshops and have consultations with their trainers. This classification is significant because it highlights that aspect of teacher development which occurs through informal learning and which grows from the purpose and direction of a teacher's own work, the sense they make out of their understanding of what works and what does not. In line with this, Lieberman also pointed out that formal education and training only contributes a small proportion of teachers' learning.

Teacher growth through PD can be seen along a continuum which slowly moves from direct teaching, the most dominant type of PD programme such as training, towards practices which involve teachers' learning from their practices in school and out of school, such as in communities with other teachers. Stenhouse (1975) was adamant that curriculum development would not be able to exist without teacher development and further that curriculum implementation could not take place without training. Day (1999) saw this view as a narrowly focused view of training which only looked at the technical aspect but not at the broader aspect of educational values.

Strengths and Criticisms of the Training Model

The greatest strength of the training model is its compatibility with the standards-based aspect of teacher development, which is often based on national set standards. The training provided is usually part of a centralised programme, which focuses on standardisation and quality control from government or other sponsoring agencies (Kennedy, 2005). Such standardisation can also be seen as a weakness as it conflicts with teachers exploring their individual needs (Kennedy, 2005). Although Kelly and McDiarmid (2002) suggest that greatest success of good PD in the last 20 years has been in teachers being recognised as professionals and incorporated into the

development process of their own PD, it does often seem the case that when a central agency such as a government body plans and carries out centralised training on a large scale, teachers are often left out of the whole process of identifying their PD needs and customizing a relevant PD programme (Darling-Hammond et al, 2017).

One of the reasons why a training model might be less than successful appears to be the disconnection between the goals of the policy and the reality in the classroom (Day, 1999). Nevertheless, Hoban (2002) claimed that the training model is effective as a means to introducing new knowledge to teachers in a decontextualized setting. Lieberman (1996) on the other hand claimed that this form of training is unattached to classroom life, is often made up of a combination of abstract ideas and pays little attention to ongoing support for PD and changing practices. This model does not, therefore, necessarily assist teachers on how to use the new knowledge introduced to them (Kennedy, 2005) and, consequently, the evidence suggests that attendance at training courses may have little impact upon teachers' subsequent classroom practices (e.g. Nzarirwehi & Atuhumuze, 2019).

Research (e.g. CUREE, 2012) into the characteristics of high professional learning for practitioners has suggested four approaches to PD which are likely to contribute to improving pupil learning outcomes. These are:

- collaborative learning in which teachers work together, try new approaches and share evidence of their learning;
- PD supported by specialist expertise such as specialist and collaborative coaching.
- PD which involves teachers in exploring and evidence regarding their classroom practices – that is, engaging in research into practice;
- Training which is sustained over time. Teachers who have been attending PD regularly will tend to have more positive impact on the learning of their pupils.

It appears that the training model of PD, if this means quick, top-down, one-shot training courses for teachers, is unlikely to result in longer term, beneficial change in teaching practices. Alternative approaches appear to be more effective.

Coaching and Mentoring

Research by Lortie (2002) highlighted that teachers often complain about the lack of time they have to collaborate and work together with colleagues and other teachers. It seems that teachers almost instinctively favour a coaching and mentoring model for their own development. Effective coaching and mentoring involves people meeting, engaging and relating with one another as well as connecting to each other on a professional level (Connor and Pokora, 2012). It seems important for teachers to have learning dialogues with their colleagues, perhaps in pairs or small groups where all parties are willing to share their perspectives.

The coaching and mentoring model focuses on relationships between teachers, usually on a one to one basis to develop professional learning (Rhodes and Beneike, 2003; Lofthouse et al, 2010). Their relationship is to support PD through partnerships with colleagues in schools or in a more hierarchical relationship, which can be in the form of a mentor and mentee (Hudson, 2013; Gordon and Brobeck, 2010; Aladejana et al, 2006). The goal is to develop a non-

threatening relationship to encourage discussion (Connor and Pokora, 2012; Joyce and Showers, 2002). Neenan and Palmer (2001) emphasised that the relationship fostered through coaching and mentoring is one which is a collaborative relationship that focuses on problem solving in a structured manner.

A coaching and mentoring programme serves as a platform to provide the space for professional learning to take place (Burley & Pomphrey, 2011; Parsloe and Leedham 2009). Rhodes and Beneicke (2003) explained that coaching is more skills related while mentoring also involves a professional friendship and counselling. One partner is often more experienced than the other, such as a senior teacher and new teacher or even a head of department and subject panel member (Rhodes and Beneicke, 2003). Garvey et al (2014) and Brunner (1998) explained that there are variations of coaching and mentoring which can be planned and incorporated into teachers' PD and activities can take place in a wide range of contexts. In addition, it is important for participants to have a full understanding of the activities and strive for a consensus when working with coaches and mentors in pairs or groups (Garvey et al, 2014).

Strengths and Criticisms of the Coaching and Mentoring Model

Joyce and Showers (2002), whose work was the principal motivator towards a coaching and mentoring model of teacher PD, stressed that the main concern of coaching and mentoring was to help pupils benefit from their teachers' learning, growth and change. They outlined a few principles of peer coaching:

This works best if it involves an entire faculty of teachers with all members in coaching teams.

- Members need to agree collectively to practice or use whatever changes the group decides to implement.
- They should support one another in the process of change and share the task of developing lesson plans and materials.
- Finally, they should collect data on the whole process of implementation, including monitoring the effects on pupils' progress.

Gathercole (2009) reported positive feedback from a teacher to teacher approach to PD. It led to high levels of pupil engagement and the teachers were very enthusiastic. This demonstrated that teachers can be innovative in creating new lesson plans and promoting independent learning by working collaboratively. Peer coaching among the teachers had supported their learning through reciprocal observation and the giving of feedback. It was more informal than observations of teachers which involved inspection, monitoring and accountability and hence less threatening. Leat et al (2012) have emphasised that through the coaching and mentoring process, teachers have opportunities to become learners again and are given the chance to step out of their hectic daily schedules of planning lessons to interact with other teachers and discuss issues related to pedagogy and learn more about other teachers' contexts and practices. Additionally, they are enabled to reflect on their own teaching during the coaching and mentoring process where they are able to break an issue down into small episodes and work together to find some solutions to improve their teaching (Leat et al, 2012; Thomas and Smith, 2004). The process thus has a good deal in common with the lesson study approach in which groups of teachers plan a lesson together, teach it or observe their colleagues teach it, then reflect together on the effectiveness of the lesson. A review of the literature

on lesson study (Ming Cheung and Yee Wong, 2014) and an evaluation of its use in UK schools (Godfrey et al, 2018) have identified positive evidence to support the benefits of lesson study in helping teachers examine their teaching practices and in enhancing student learning. A large-scale study (181 schools) by the Education Endowment Foundation (Murphy, 2017), however, found no evidence that the use of lesson study improved primary students' maths and reading attainment, although the teachers involved in the study did report that it was useful professional development, and valued the opportunity to collaborate with their colleagues in a structured way.

Rhodes et al (2004) have also argued that coaching and mentoring can support the professional practice of teachers especially by enhancing teachers' self-esteem and confidence through the support given by their peers, colleagues and mentors. Thomas and Smith (2004) have also highlighted other advantages include working more effectively, encouraging personal growth in teachers' careers, motivating other peers and teaching and working well in teams.

On the other hand, Allan (2007) found that there are some issues that may arise from the use of coaching and mentoring as a form of PD, and these are related to the selection process of suitable coaches and to establishing trusting relationships, which may not happen automatically. How are coaches selected and on what criteria are they paired up or grouped together as mentors and mentees? (see also Carter and Francis, 2001). It appears that the criteria related to the qualifications and skills of the coaches selected for a coaching and mentoring programme have to be clearly stated and laid out. Aladejana et al (2006) highlighted a disadvantage of the mentor mentee relationship in that coaches and mentors can become over protective of their mentees, which can result in a lack of unity in the pair or groups. The gender factor was also noted as in certain countries which have cultural stereotypes, male teachers would not necessarily be comfortable with a female coach and mentor.

Allan (2007) has also stressed that it would take time before teachers saw the benefits of activities from coaching and mentoring. This is usually a slow process as it is often planned as a bottom-up initiative with the potential to empower teachers. Maintaining this ground-based approach is, however, seen as crucial if teachers are not to perceive coaching and mentoring as just one more way to judge their performance.

Summary

According to Nicholls (1997), teachers have a psychological need to construct knowledge which leads them to participate in Professional Development. Although a teacher's development can be seen in isolation, they inevitably need the support of their institution for this development. Institutions naturally have a strong interest in developing the skills of their teachers, but they can only achieve this by working WITH these teachers in their development. PD, therefore relies upon mutuality between teachers and institutions. Curriculum development and educational reform, all new plans and changes to improve teaching and learning in schools, emphasize the need for high quality PD for teachers (Guskey, 2000). Teachers must experience high class PD but also be provided with time to integrate new knowledge and skills into their curricula. Teachers also need time to adapt their practices to meet pupils' needs and to learn to use the curriculum they are working within. PD should be able to support the teachers with subject matter, strategies for pupils' learning and new

teaching practices. Training has been used globally as a form of PD to fill this gap but its impact and effectiveness have been significantly questioned (Yan and He, 2015).

Literature review main outcomes

Curriculum and curriculum change

- A curriculum needs to be developed through social understanding in a quest to provide educational goals which promote maximum personal development for pupils.
- Effecting curriculum change will not by any means be a simple process. Neither teacher enthusiasm/skill, nor the effectiveness of the innovation are sufficient to sustain it. There need also to be changes in organizational structure, rules, and procedures as well as top-down support to help counter threats that could de-stabilize an innovation.
- Essential conditions for the sustainability of an innovation are teacher and pupil support for the innovation, teacher perceived value of the innovation, teacher professional development, and leadership approval.

Inquiry-based learning

- The PYP is a curriculum whose distinctive characteristic is its engagement of pupils in inquiry-based learning, a key element of the Approaches to Learning (ATLs) which underpin IB education more broadly. Recent research findings in the learning sciences suggest the effectiveness of a constructivist, inquiry-orientated view of learning.
- Contemporary inquiry-based methods involve high levels of scaffolding for pupil learning, meaning the question is not so much whether inquiry-based learning per se is useful, but rather in what conditions can inquiry-based learning be most effective.
- Co-operative learning has been shown to evoke clear positive effects on three principal categories of outcomes: student achievement, attitudes and perceptions.
- Much of the power of an inquiry-based approach to teaching and learning lies in its potential to increase student engagement and deepen understanding through developing a collaborative approach to learning.

Knowledge-based curricula

- A typology of curricula divides them into programmes which privilege either the acquisition of subject knowledge, the development of competencies and skills, or pupil-led learning.
- Some countries, including the UK and the USA, have given the promotion of knowledge a key role in their curricula.
- Critics have argued that it is not 'knowing' facts that is important for students, but also understanding the significance of these facts.
- It is a mistake to assume that a knowledge-based curriculum can only be taught using a traditional pedagogy.

Curriculum integration

- There are three possible orientations to the integration of curricula: Multidisciplinary, Interdisciplinary and Transdisciplinary. The IB PYP is specifically described as transdisciplinary "to convey learning that has relevance across the subject areas and more importantly, learning that

transcends the confines of the subject areas to connect to what is real in the world" (IBO, 2010, p.1).

The importance of agency

- Human beings develop knowledge and meaning in their minds not just because somebody implants that knowledge or meaning, but because they actively construct it.
- Human agency is the potential of people to act upon their world purposefully, in situations where it is possible to take different courses of action. Learners need therefore to be seen as decision-makers rather than just repositories of knowledge.
- Research has examined efforts to increase student voice and agency at the classroom level and found that students improved academically when teachers ran their classrooms in ways that valued student voice.

Professional development

- Teachers' professional development needs to include opportunities for teachers to focus on subject matter that includes hands-on practice which can be integrated into their daily classroom teaching.
- Three classes of professional development involve transmission models (e.g. training and cascade approaches), transformational models (e.g. coaching & mentoring), models focused on professional autonomy (e.g. action research).
- Institutions naturally have a strong interest in developing the skills of their teachers, but they can only achieve this by working WITH these teachers in their development.

The complexity of change

From the research reviewed above, it is clear that educational change is a complex system with multiple aspects, each of which needs to be understood by those hoping to instigate a change process (Hoban, 2002). The complexity of change, for schools introducing new policies and for teachers effecting developments in their practice, depends upon several elements, including school leadership, school culture, teachers' lives and day-to-day experiences in classrooms, organisational structures, local and wider politics, macro-, meso- and micro-contexts and teachers' willingness to develop and learn (Hoban, 2002). These elements need to act collectively for long-lasting change to be possible. It is clear, therefore, that in researching a particular change process, we need to be acutely aware of the dynamic interactions among the various elements in a complex education system. The project, therefore, was guided by some quite complex research questions.

Methods of Inquiry

The study was planned to include three questionnaires and 6-8 case studies. In the event, however, due to the international situation regarding the coronavirus pandemic, it was possible only to administer the initial questionnaire and carry out seven case studies. This also meant that we were unable to fully address all of the research questions set.

Questionnaire

The purpose of the initial questionnaire was to establish a picture of the views of the various stakeholders at and immediately following the launch of the enhancements to the PYP in October 2018. The specific goals of this questionnaire were to:

- identify IB PYP schools' views and perceptions of the enhancements;
- provide a baseline against which to compare possible further research to investigate the perceived impact of the PYP enhancements on the IB school experience of implementing the PYP programme, with specific attention to the transdisciplinary framework.

The questionnaire (see Appendix 1 for a copy of the English version of this) included questions about:

- the school background;
- the individual teachers'/middle leaders'/ principals' backgrounds;
- levels of expressed knowledge about the enhancements;
- perceptions of communication strategies related to enhancements to the PYP;
- the degree to which respondents felt the enhancements met IBO goals (better for students, easier for teachers, more flexible for schools);
- how far respondents felt the enhancements would strengthen planning, teaching, learning and assessment within a transdisciplinary framework and maximise successful implementation of the IBO PYP philosophy;
- open questions about the enhancements.

The PYP is offered by 1472 IB schools in 109 countries worldwide. We aimed to target a questionnaire response from 25% of these schools – that is, from 368 schools. The first electronic questionnaire was administered in the three working languages: English; French and Spanish. The survey was directed initially to the head teacher / principal of each school, with a request to forward it to all PYP teachers and the PYP Coordinator. We included biographical questions at the beginning of the survey.

- The questionnaire was distributed in the Autumn of 2018, with a closing response date of 26th November 2018. The Thanksgiving holiday in the USA and many US schools meant that the 1158 fully completed returns initially received were somewhat unbalanced and further categories of schools were targeted to balance the responses. The final responses were from 1524 individuals, representing 486 schools. This exceeds the 25% of IB PYP schools that we aimed to sample.
- The target survey group aimed to include schools which broadly represented the IB school population in terms of:
 - Authorised and candidate schools
 - IB Region
 - IB Schools division school type

- Private international
- Private national
- Public US
- Public Rest of World
- Language base.

Case studies

The study included seven case studies of authorised PYP schools. Negotiating access to most sites was unproblematic, except for the US national schools, who agreed to participate initially but for whom it proved very difficult to find convenient times to visit- this was eventually accomplished somewhat later than other cases.

Schools with less than 250 students were designated small, schools with more than 500 as large and schools with 250-500 as medium.

In each school a researcher made personal contact with the PYP Coordinator and arranged a schedule for a two or three-day visit. This included:

- An individual interview with the principal or headteacher;
- An individual interview with the PYP Coordinator;
- Group or individual interviews with at least 4 homeroom or class teachers;
- Group or individual interviews with specialist teachers;
- Group or individual interviews with Teaching Assistants, Librarians
- Group interviews parents
- Group interviews with older students (grade 4 and above)

The recordings were transcribed and were analysed in Nvivo.

The pilot interviews indicated that teachers and some principals, parents and students did not know enough about the enhancements to comment without a prompt sheet and that such a sheet made teachers feel unprepared. Instead, we used summary cards of the enhancements and asked participants to arrange and comment on these in a variety of ways that addressed the interview schedule topics. This elicited more comments and promoted discussion in the groups. (See Appendix 2 for a list of the interview questions and topics, plus a copy of the summary cards used.)

School	Region	School type	Size	Authorised PYP	Dates	Other interesting features
Australia 1	IBAP	Private national	Large	2009	Aug 2019	Denominational school In city. Very long established. Intergenerational attendance
Canada 1	IBA	Public (ROW)	Large	2015	June 2019	
East Asia 1	IBAP	Private International	Large (PYP medium)	2007	May 2019	Part of English Schools Foundation- well established in HK. Does not get government funding like some in the group Local language (not national) focus
Middle East 1	IBAEM	Private National	Large (1160)	2017	May 2019	Very strong Arab International identity and offering bilingual teaching.
Scandinavia 1	IBAEM	Public (ROW)	Medium	2011	Aug 2019	State school and influencing other non IB schools locally. Interesting tensions with school starting age locally
UK 1	IBAEM	Private Intl	Small	1997	May 2019	Well established. Part of a multi-site, private organisation, with its own assessment requirements.
USA 1	IBA	Public (US)	Medium	2013	2019	IB school board-wide. Shared PYP Coordinators with other schools. Shared ENHANCEMENTS TO THE PYP programme of training.

Table R1: Case study school characteristics

Table R2 below shows the numbers of interviews carried out in each case study school.

	Australia 1	Canada 1	East Asia 1	Middle East 1	Scandinavia 1	UK 1	USA 1
Principal	1	1	1		1	1	1
PYP coordinator	1	1	1	1 (also Head of Primary)	1	2 (one Early Years coordinator)	1
Class/homeroom Teachers	6	4	2 groups of 6 and 5	Steering committee teachers 2 groups of 7 and 5	2 groups of 4	3 groups of 3, 2, and 4	8
Specialist Teachers	1(language)		2 (language and art)	6	4 (including librarian)	1 (language)	2 (language)
Teaching Assistants/other		1 (librarian)	4 technology support	8			Also visit to inclusion provision
Parents	4	4	5	5	5	3	2
Students		6	6	6	6	3	6

Table R2: Interviews conducted

Descriptions of the data arising from each case study school are given in full in the Appendices to this report.

Findings

This report details the findings from the initial questionnaire and seven case studies.

Questionnaire

The questionnaire responses were well balanced by **IBO Region**, both in terms of school and individual responses, with the fewest responses from Asia Pacific.

	No. Schools	No. Respondents	Population
IBA	211 (43.4%)	631 (41.4%)	782 (49.6%)
IBAEM	109 (22.4%)	378 (24.8%)	339 (21.5%)
IBAP	166 (34.2%)	515 (33.8%)	455 (28.9%)
	486 (100.0%)	1524 (100.0%)	1576 (100.0%)

Table R3: Number and percentage of school responses, individual responses and schools in the (authorised) PYP population by region.

Further detail about the respondents to the questionnaire can be found in Appendix 3 of this report.

Results of the questionnaire

The most important thing to note about the results is that these teachers were exceptionally positive in their levels of agreement with statements. In the following section we will outline the headline outcomes from the questionnaire. A good deal more detail about these can be found in Appendix 3.

How informed did teachers feel about the enhancements?

Few of the teachers felt completely uninformed and a surprisingly high percentage felt completely informed. This is a good start, as it suggests that many teachers were aware of the planned changes.

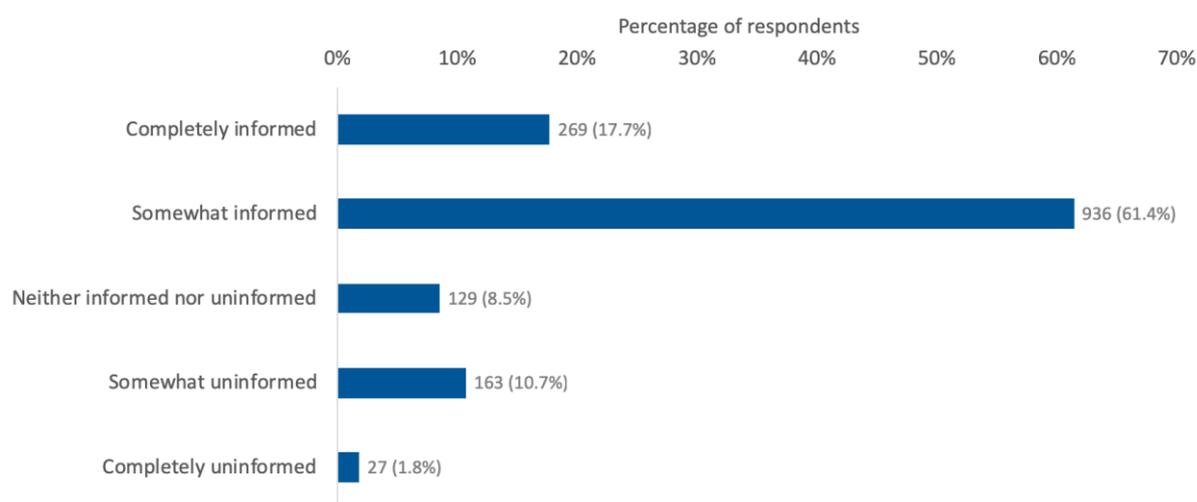


Figure R1: How informed do you feel about the enhancements to the PYP?

There were differences between school types in the extent to which people felt informed. Respondents from Public (USA) schools felt, on the whole, less informed. This might relate to the way information had been shared.

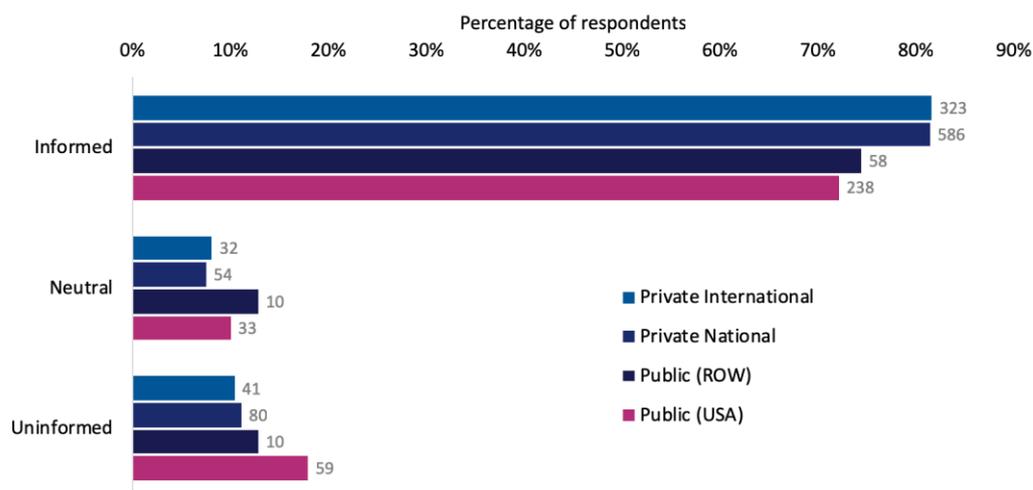


Figure R2: How informed do you feel about the enhancements to the PYP by school type

There was also evidence of a knowledge gradient in terms of respondents' feelings about their levels of being informed. This can be seen in Table 4 below.

Respondent's role at the school	Those feeling completely or somewhat informed	Those feeling completely or somewhat uninformed
School Principal, Director or Head Teacher	74.60%	17.46%
Primary/Elementary Principal or Head Teacher	74.07%	12.59%
Middle leader (e.g. teaching PYP coordinator)	82.45%	7.03%
Middle leader (e.g. non-teaching PYP coordinator)	84.45%	8.13%
PYP Specialist teacher (please specify subject)	69.89%	14.87%
PYP Generalist teacher	66.91%	15.01%
Other (please specify)	74.04%	9.79%

Table R4: Levels of being informed about enhancements.

Middle leaders (PYP co-ordinators) were most likely to feel informed about the enhancements, and PYP teachers least likely.

Finding out about the enhancements

The respondents were able to choose as many ways they had found out about the enhancements as they needed. The most common way was PYP Coordinators sharing developments with the teachers in the school.

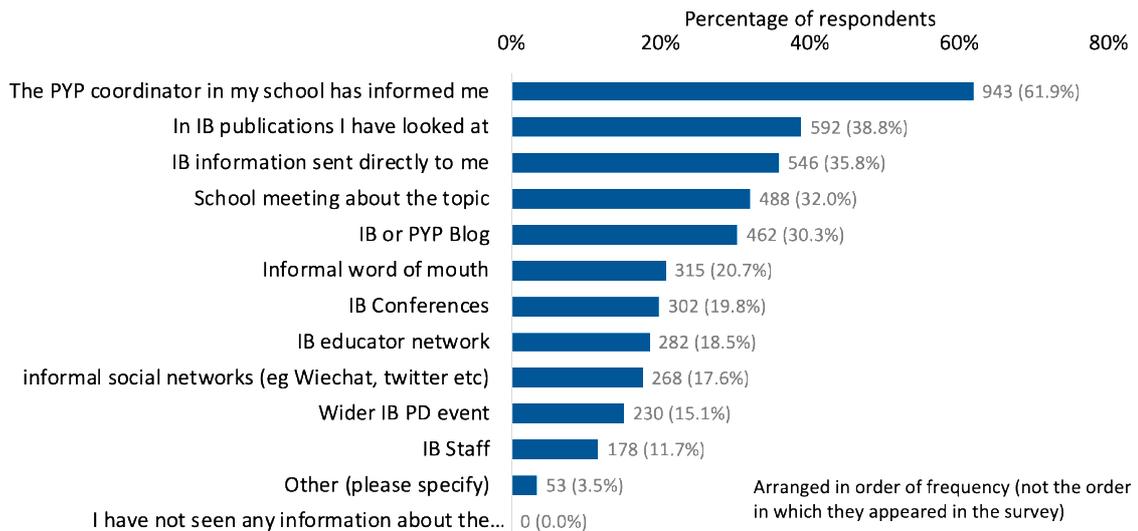


Figure R3: How teachers had learnt about enhancements to the PYP

What were respondents most aware of?

Respondents were invited to indicate which PYP enhancements they were aware of. Most were aware of the enhancement of the role of play (though fewer were aware of the extension of Early Years to age 6), and of agency as an important part of the enhancements. They were least aware of the possibility of teaching social science and science outside transdisciplinary units, the re-positioning and non-reporting of the Exhibition and the flexibility in ATL skills.

What did respondents think would best support them as they introduced the enhancements?

PD workshops and school meetings were chosen as the most effective ways respondents felt they could be supported in the introduction of the PYP enhancements, raising questions about the frequency of such events.

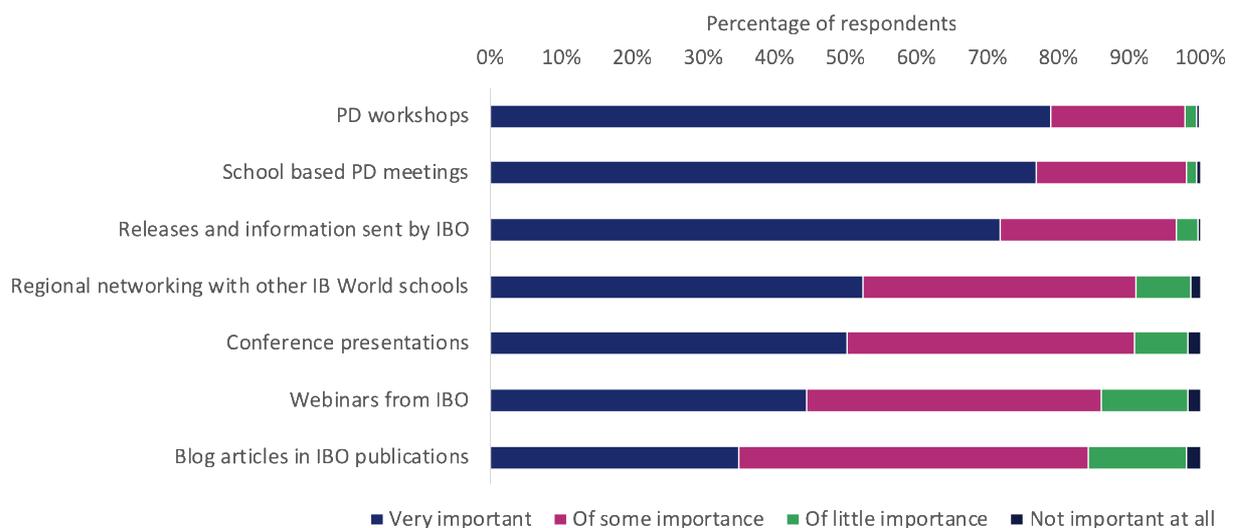


Figure R4: Please rate the following types of PD as supporting the introduction of the enhancements

Did respondents believe the enhancements would help them meet IBO goals?

We asked respondents to what degree they agreed that the enhancements would make the PYP **better for students**. They were very positive about the likely effects in general, in particular the role of play as a vehicle for inquiry in the Early Years, but **least enthusiastic** about the re-positioning of the Exhibition, turning *PYP: Principles into practice* into an online resource and ceasing reporting on the LP.

We asked how far respondents agreed that the enhancements would render the PYP **easier to implement**. They were generally very positive about the likely effects, in particular the idea that schools could determine duration and time frames of each unit of inquiry. They were least enthusiastic about the positioning of the Exhibition outside the POI or as a seventh unit (although more positive about its not being reported), giving agency a central role in the PYP and action as an outcome of agency. The emphasis on agency is, perhaps, the biggest philosophical difference in the enhancements and it is not unreasonable for teachers to recognise it as a significant new challenge at this early stage.

We asked how far respondents agreed that the enhancements would render the PYP **more flexible for schools**. They reported being generally very positive about the increased flexibility the enhancements could confer, for similar reasons to those advanced in the previous question, but least enthusiastic about the online resource, re-positioning of the Exhibition, giving agency a central role in the PYP and action as an outcome of agency. The emphasis on agency is, perhaps, the biggest philosophical difference in the enhancements and is, as yet, untried.

Would the enhancements strengthen planning, teaching, learning and assessment within a transdisciplinary framework and maximise successful implementation of the IBO PYP philosophy?

We asked respondents to express a level of agreement with a statement that the enhancements would strengthen teaching, learning and assessment within a transdisciplinary framework. Most agreed, with a percentage uncertain or unwilling to commit.

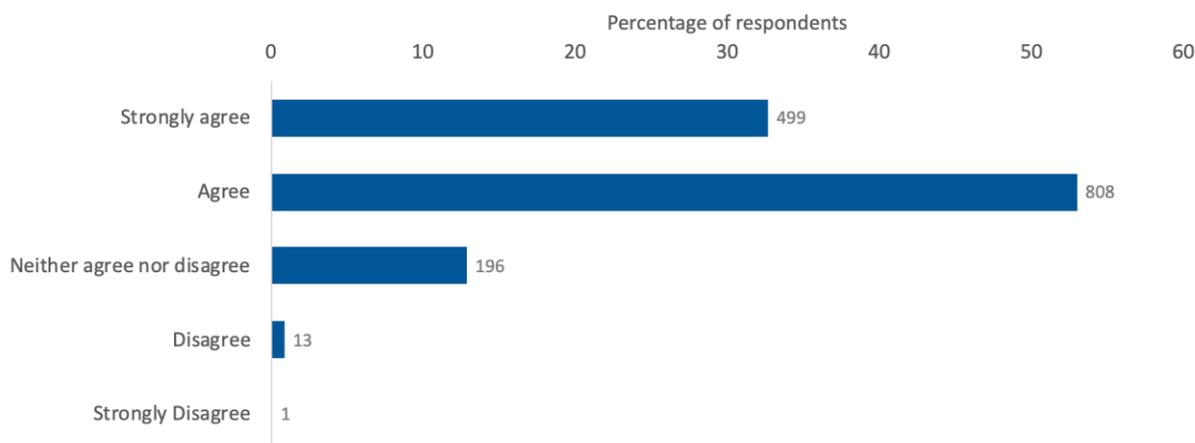


Figure R5: The enhancements will strengthen teaching, learning and assessment within a transdisciplinary framework

We asked respondents to express a level of agreement with a statement that the enhancements would maximise successful implementation of the IBO PYP philosophy. Most teachers agreed, with a percentage uncertain or unwilling to commit.

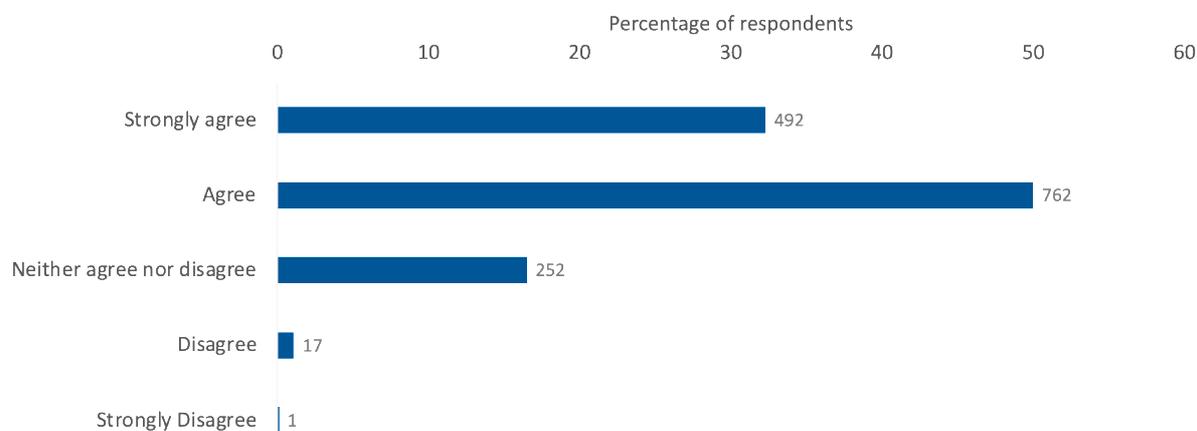


Figure R6: The enhancements will maximise successful implementation of the IBO PYP philosophy

In view of these overwhelmingly positive responses it was important to examine the qualitative responses and these are summarised below.

Open questions

Four open questions were asked at the end of the questionnaire, namely:

- What changes to the PYP do you welcome most? Please tell us why.
- What changes concern you most? Please tell us why.
- What PD opportunities would you most value to implement the enhancements to the PYP?
- What resources will help you most to implement the enhancements to the PYP?

These questions generated thousands of comments, in three languages, and many of them were very similar. Simple word frequency counts identified the key issues, noted here with a sample of the comments. A more detailed picture of these comments can be seen in Appendix 4.

Some of the responses seem to indicate unexpected understandings of some of the changes, and some interesting comments about the practices hitherto adopted. For example, some comments welcomed the new opportunity to include direct instruction alongside inquiry, or to include play in kindergarten classes. These are practices which were common before the enhancements. Other responses included comments such as not having the Learner Profile anymore. This suggests that some understandings of the enhancements were as yet undeveloped.

All the open answers include a good many disclaimers relating either to the candidate status of schools, an upcoming evaluation visit, the need to give attention to an authorisation visit before engaging with the enhancements,

Agency

The idea of agency (frequently linked to action) was widely welcomed and teachers clearly saw it as a really important feature of the enhancements. However, it was often hard to say what teachers welcomed about agency or why, as these answers were less specific than those about flexibility, reflection, Early Years, the planner etc. However, there were some answers that were very explicit, citing student and teacher agency. For example:

The emphasis on agency - it provides a vehicle for teachers to recognise students as agentic learners and strengthen the partnership between all members of the community. It provides empowerment to students.

The focus on student agency and action is more prevalent. I think this is something we want our students to embody, even in the Early/primary years.

Early Years

Respondents appeared to welcome all the changes to the Early Years, especially the change in the number of units and the emphasis on play. There were a few responses that were clearly confused about the extension to age 6.

I am most excited about the change to include Early Years learners as up to age 6, and to emphasize the element of play.

As part of the Early Years department, I strongly agree with the learning through play because I think in today's day, it's an important skill to have as a child. Being able to play and know how to play.

The planner

The planner was mentioned many times, largely in appreciation of flexibility or difficulty of use of the old planner. A great many commenters said they welcomed flexibility in using the planner, but many answers were not specific about which features they liked.

We can create our own planner - we've been doing that already and have been hiding it from the PYP. Now we can put in the planning document that which is important to us.

I'm looking forward to a different format for the written planner. The old template was difficult for people to understand and difficult to include everything required.

Changes to the position of reflection

Commenters said they welcomed what they saw as the integration of reflection more across the curriculum.

Including reflection as a daily occurrence

I appreciate that reflection has become an embedded part of the program as opposed to only a Learner Profile. Students should reflect every day.

subjects outside the POI and the planner in ways that suggested they saw these as threats to the integrity and philosophy of the PYP.

The notion of change itself and operation of changes was a major concern for respondents, and they expressed this in terms of training, time, workload and support needs.

This question elicited a good many *I don't like...* . These negative comments, were not evident from the questionnaire responses but do suggest a range of feelings about the changes within a culture of positivity. The negative comments included disapproval of the changes to reflection, the Exhibition, assessment and the Learner Profile.

The transdisciplinary framework and philosophy of the PYP

This was a moderate theme in the responses, with 24 expressing concern and only 14 specifically welcoming changes. This theme also involved responses centred around flexibility, subject teaching outside the POI and terminology.

Science and Social Studies being taught outside the POI - this may encourage some teachers to revert to 'old style' methods of teaching and isolated knowledge and skills.

Teaching science as stand alone. The transdisciplinarity of the PYP is such an important part of the program's identity. It feels like a stepping stone towards subject focused lessons. How do you make sense of your world if you learn science in isolation?

Change and training

These responses concentrated on the time to achieve change, the resource demands of changes and the support needs identified in terms of resources and materials.

Having to get everyone re-trained. There are some deep understandings that will need to shift. Training takes money. The faster we are all re-trained, the better, but money takes time.

The time to implement those changes and the IB support to help teacher on how to implement those changes

Flexibility

This set of responses was about the possible practical difficulties of flexibility, rather than the impact of flexibility on the programme or philosophy

I'm concerned about being able to create our own planning template.

I think teachers may worry if they are able to create their own planning forms, AtL etc as this may seem like more work to them

Agency

Agency was identified as a main concept causing concern. The many comments suggested teachers were simply not sure what agency meant in school contexts.

The concept of Agency scares me. I finally understand what Agency is and what it means for our students and staff. However, I feel that it's going to be hard for them (staff and students) to embrace the concept of choice in everything that they do. Meeting state standards and

incorporating IB is hard enough, so giving up control and giving students choice is going to be very challenging for some.

I think that the most unclear is on what student agency looks like. I think it has the potential to be the least understood.

Assessment

Many concerns focussed on assessment and teachers did not yet seem confident about what the enhancements recommended or what guidance was available to them.

The lack of reporting on the Learner Profiles and the subsumed attitudes. They always were a part of the USP of the IB; fostering citizen of the future. Having them be part of the reporting cycle placed an emphasis on character development not just academic.

The assessment of a more integrated nature, as teachers are accustomed to being comfortable with the summative task. I feel the unlearning of it may have hiccups.

The planner

The flexibility to use the planner was not universally welcomed and there was a feeling of fear about how this would develop.

After reviewing the new PYP planners, I was disappointed in how the process continues to be burdensome on teachers. I was hoping the planning process would be reflected in the new planner more concisely, so teachers can use the planner effectively.

Changes in PYP planner. Not sure what my school will be doing with this.

Learner profile

Some respondents were concerned that not reporting the LP reduced its status.

Removing the IB Learner Profile

Exhibition

There were a good number of comments expressing concern about the possibility of the Exhibition being reduced in status, not having time to prepare and not reporting the Exhibition.

About the Exhibition. How can we implement it outside the POI?

Exhibition as the 7th unit. I am concerned of the time frame. Will we have enough time to prepare for the Exhibition?

There were individual or few concerns expressed about inclusion of technology, the burden of multilingualism and requests for new documentation, resources and support materials.

What PD opportunities would you most value to implement the enhancements to the PYP?

There was a good deal of appreciation of the PD already available to PYP teachers: upskilling workshops; PYP Training Group; webinars etc. There were also comments about new PD and a great many responses saying that they did

Case studies

The case studies were analysed using NVivo, coding both comments about the enhancements and issues arising (including actions taken, changes proposed and barriers to change). In addition, a case study report (see Appendix 5) was written for each case, reviewing the school situation, staffing, actions on enhancements, mechanisms for learning about the PYP and proposed actions.

The schools were visited during the first academic year of the introduction of the enhancements to the PYP's and their trajectories for implementation of these enhancements were not uniform or aligned. All the schools we visited claimed to be in the very early stages of implementing the enhancements and most of them also claimed to be ahead of the game in that implementation. In the following section of the report we will discuss the perceptions of case study schools and their teachers and have organised this discussion around a series of key questions.

How did the case study schools and students view the enhancements to the PYP?

The survey pattern of overall positivity and enthusiasm for the enhancements to the PYP was evident in all the case study schools we visited, led by PYP Coordinators. All the schools positively welcomed most of the enhancements proposed. The most mentioned headlines were agency and flexibility, with some emphasis on the changes to the Early Years age phase. These findings did not duplicate the results of the survey results but did reflect the responses to the open questions in the survey.

All the school staff had some awareness of agency and most knew it had been identified as a key IBO goal. Some enhancements were identified as important by all the schools. These were the topics schools wanted to discuss: agency; flexibility in the timing of units; changes to planning; flexibility in teaching outside the transdisciplinary units of inquiry (TUI); changes to assessment; changes to the Early Years; learning environments and greater inclusion of science.

Some innovations were seen as important by most participants (technology, action; inquiry; language and translanguaging, international mindedness, inclusion; wellbeing) but not the focus of discussion or action by most of the schools. Sometimes this was because some features of the enhancements to the PYP were difficult- notably action, which all the schools recognise as continuing to be challenging. Other innovations, such as wellbeing or inclusion are seen as obvious ongoing school priorities for all the case study schools.

Other enhancements to the PYP were barely mentioned or dismissed as unimportant to that school at that time. For example, policies were seen as an interesting idea in one school by teachers who were unaware of their existence, as a routine updating job in another school and barely mentioned in most schools.

The response to the new electronic resource was more varied. The PYP coordinators were enthusiastic about it. However, despite it being one of the features of the enhancements most welcomed in the survey results, most of the school leaders and teachers did not know about it and those who knew about it had not used it independently. Those who had looked at the electronic resource, had done so at the direction of the PYP coordinator who had, sometimes, printed

out items from the resource. There seem to be a number of problems associated with this resource. Firstly, some schools had access problems which had prevented full engagement with the resource so teachers who might have used it had, instead, accessed other open-source materials about the enhancements to the PYP (For example in East Asia, Canada). However, in contrast, teachers in some schools were not used to looking up materials unless the coordinator prompted them to do so, or used them in a PD session, raising questions about teacher autonomy and agency.

How aware of the enhancements to the PYP were teachers, coordinators and school leaders?

All the PYP schools were aware of the enhancements to the PYP but there was a knowledge gradient from PYP coordinators to teachers in most of the cases.

All the PYP coordinators knew about the enhancements in detail and were thinking about how these would affect their schools. PYP coordinators had undertaken training about the enhancements and had participated in discussions within school groups, districts or foundations about how to implement the enhancements in their schools and which enhancements were priorities. However, the extent of these discussions depended on the scale of the network the school was part of, and the level of IB support it offered. In some organisations, other priorities, such as upcoming inspections or the introduction of mandatory state tests or curricula, dominated the agenda.

Teachers' awareness and understanding of the enhancements varied. The interpretations of an enhancement were sometimes very different in different settings. For example, in one school the four EY units were greeted enthusiastically by the co-ordinator because it would allow those units to be done in more depth and take longer. She felt that the school had previously not been able to spend enough time on each unit. In another school the four units were greeted with enthusiasm because this would reduce the time spent on transdisciplinary units and more subject teaching could be accommodated.

In some cases, the teachers were extremely well informed, had done whole-school training and researched aspects of the enhancements themselves such as in East Asia 1 and Canada 1. Whilst in other schools (USA 1) the teachers had done training, but claimed to know almost nothing about the enhancements. They had clearly been working on aspects of the enhancements to the PYP (particularly the introduction of ATLs) in their planning and had also been doing whole school work about some of the innovations which were to become enhancements, such as learning environment.

The term *enhancements* was not always a clear label for teachers, who considered aspects of the enhancements as part of ongoing school development. In some schools, the term *enhancements* was either not recognised, subsumed or generalised to include all school development activity, even where it was directed towards a different goal. (UK 1)

The specialist subject teachers said they were less well informed about the enhancements to the PYP than homeroom teachers, although all the teachers had been given details and had had the opportunity to discuss the enhancements to the PYP. In most of the case study schools, both the homeroom and specialist teachers felt that the onus was on the homeroom teachers to take the lead in incorporating the enhancements into their classes.

The level of understanding of the enhancements of school leaders depended on their role in the school. Where they were deeply immersed in the operation of the PYP, some head teachers had detailed knowledge of both the intent and operation of individual enhancements (East Asia). In other schools the intent was clear and the leaders monitored progress towards inclusion of the enhancements to the PYP as an issue for re-accreditation (US1, Canada 1) but were not involved in every innovation. Other school leaders recognised the enhancements as part of their wider school development programme but also subsumed their own goals into the enhancements to the PYP.

What were overall satisfaction levels with the enhancements to the PYP so far?

Respondents were, overall, very satisfied with the content of the enhancements, to the point where some aspects were accepted as completely routine and school colleagues had little or nothing to say about them. For example, every teacher, coordinator or school leader supported the removal of reflection as a separate concept. All acknowledged it as logical and saw it as inevitable.

Other enhancements were seen as much more challenging, for a variety of reasons, but were nevertheless welcomed. Agency was seen by teachers, coordinators and some school leaders as the most important and most challenging enhancement and one which was new, or at least clearer, to them as a priority. Everyone who spoke about it applauded it on philosophical grounds - that is, the focus on the learner - even in a school where the coordinator reported that there had been initial suspicion about the idea of greater pupil choice in learning.

The coordinators and teachers showed implicit focus on the learner and were keen to discuss ways that students were given ownership of their learning, ways that students could be involved in planning and reflecting on learning. The teachers sometimes struggled to identify ways in which agency could be promoted. They found it difficult to recognise good practice and would welcome examples and case studies.

A number of the teachers linked agency and ownership of learning to the Approaches to Learning (ATL), with the link seeming to be one of increased metacognition in student learning. Alongside agency, the use of ATLs in the planning of transdisciplinary units of inquiry (TUI) was one of the most recognised and welcomed enhancements to the PYP but there was sometimes confusion about who would decide which ATLs would be adopted for use. So, the Canadian school were not sure whether this would be a district level choice. The US school had chosen ATLs as a school district. Other schools had made their own choices.

Teachers and coordinators linked discussion of the ATLs with changes in planning and new planners, as teachers saw the ATLs as an issue for their planning. The adoption of new planners was widely welcomed (although the IB non-writable flower was remarked on widely). Teachers found the old planner repetitive and limiting. Generating new planners was done in different ways in different systems. In the US case, the whole school district shared many aspects of planning and used a shared new planner, which was evolving as the enhancements to the PYP was introduced. In Australia, the Early Years planner had been abandoned and its replacement was under construction and had resulted in a much more fluid process for Early Years planning. The Canadian

school was experimenting with different planners in different classes. The discussions of planning in the cases evinced a deep tension in some teachers between their roles as curriculum innovators and their role in simply delivering the curriculum. The need to re-design units and, especially, the planning demands where two curricula needed to be addressed together, placed heavy demands on them. At the same time, they showed a deep commitment to personalising the curriculum and making it relevant to their classes.

The change to the Early Years' age phase was greeted enthusiastically by all the schools, at least in principle. The coordinators, Early Years teachers and school leaders all welcomed a recognition of the importance of play, which they felt IBO had been slow to foreground. However, in some of the cases the enthusiasm for an extended EY period and play-based curriculum was not reflected in actions, because there were high stakes assessments to address at a particular year point. In one of the schools, EY provision was very experimental, because this was before the national school starting age.

An enhancement welcomed by all the school leaders, coordinators and teachers was greater flexibility in the length of Transdisciplinary Units of Inquiry (TUIs). Teachers articulated their frustrations with six week units in all the schools and planned for varied lengths of units, including year-long units. In some schools these seemed to be a whole school topic for inquiry which would be studied in different ways by different year groups. In other schools a year-long unit was a thinly veiled adoption of continuous teaching of a subject perceived as important such as phonics or chemistry, inside the Program of Inquiry (POI) but separate from other units of inquiry.

Most of the school leaders, coordinators and teachers greeted the possibility of teaching science and social science outside the POI enthusiastically, although not all. Their enthusiasm, however, included a number of separate concerns. Some teachers and schools saw teaching science and social science outside the Transdisciplinary Program (TP) as a sign of greater flexibility about teaching outside transdisciplinary units in general, especially for curriculum areas like maths which are generally taught outside the POI to some extent. Other teachers were enthusiastic about the possibility of teaching more science, which they felt had not fitted well into the TP or indeed, the PYP, and which was seen as necessary by some external bodies or the teachers themselves. Other schools welcomed teaching outside the transdisciplinary programme as a way of addressing some of the demands of other curricula they taught alongside PYP.

Changes to assessment were welcomed by most of the teachers, leaders and coordinators, in principle, at least. They all supported increased formative assessment as a positive aspect of the focus on the learner. However, the most common response to questions about what had been done was that the school was using SeeSaw (a portfolio program used to curate students' work) and some of the new assessment approaches that schools had chosen to adopt or had had imposed upon them were summative and test orientated, in direct contrast to the philosophy of the enhancements to the PYP.

Some less important enhancements were greeted with unremarkable satisfaction. Some of the case study schools said they had not reported on the Learner Profile anyway, so this was not a change for them. Leadership was also not seen as particularly interesting and was linked to agency by the teachers. Inclusion, student wellbeing and variety in learning environments were issues

welcomed by all the schools and which all staff found important, but placed as lower priorities than the exciting new idea of agency or the continued challenge presented by action. This is important as, in some of the schools there was evidence that these issues had been given a great deal of attention and the lack of attention to them as part of enhancements to the PYP simply reflected already high levels of practice. In the USA case, for example, the inclusion programme was thorough, swift, personalised and expert- but not mentioned as part of the enhancements to the PYP- because the school already felt secure in its provision.

The generally positive reception overlay a complex process of learning about and planning for change for schools to take on the enhancements. When a coordinator, principal or teachers were particularly enthusiastic about an enhancement it did not necessarily mean that actions had been taken, or were going to be taken, to make changes which addressed it. All staff emphasised that the enhancements were new and would require further consideration. Indeed, in some cases, even where coordinators were very enthusiastic about a particular enhancement, they predicted that other features of school practice would prevent actions from being taken. For example, one school staff strongly supported the additional year of EY designation but would not be changing their more formal way of working with that year group, because they felt the local external assessment demands required more formal teaching.

How far did schools see themselves as already ahead of the game?

One of the interesting features of the case studies was how often school leader, coordinators and teachers said they felt their school was ahead of the game. That is, the school had already undertaken school development work about aspects of the enhancements to the PYP. Most of the case study schools had conducted extensive school development and experimentation in areas relevant to the enhancements. For example, in the US case teachers had done work on a number of years to develop exciting, innovative and flexible learning environments throughout the age range. In the UK case and the Australian case, the building for Early Years teaching had been totally redesigned to create positive learning environments. The East Asia school had also designed exciting new learning environments for technology, languages teaching and play with input from pupils. In a number of the schools, action had been taken to promote student agency through student involvement in unit planning, school reports and planning of new learning environments (East Asia) or a whole school focus on ownership of learning (Canada). The idea of year-long units of inquiry was also something that some schools had already trialled, for example in Canada and East Asia. School staff were most keen to talk about school development that had already happened or was ongoing.

Although it is likely that schools prepared to welcome visiting researchers were comfortable with their provision, we do not think they were exceptional in this respect. The educators in these schools included IB Educator Network (IBEN) members and the teachers were very keen to talk about keeping in touch with IB thinking. They valued professional development and the reports of colleagues who attended meetings, events and conferences. The coordinators, teachers and school leaders clearly aimed to be ahead of the game and lead in developing ideas that were on the IBO agenda, in their schools.

The coordinators and school leaders also saw themselves as contributing to the development of the enhancements to the PYP, which they described repeatedly

as: *catching up with where we are*. In this sense, many of the school leaders and coordinators were talking less about implementing the enhancements to the PYP and more about how the enhancements to the PYP served the agenda of forward-looking schools.

What action had schools already taken to implement the enhancements to the PYP

Discussions of actions taken to address the enhancements to the PYP were characterised by a central contradiction. All the case study schools emphasised that it was very early days in the introduction of the enhancements to the PYP and that they had not had time yet to implement it. At the same time, all of them felt ahead of the game in undertaking school development related to the enhancements to the PYP.

Most of the schools had undertaken school development related to aspects of the enhancements to the PYP. Coordinators understood the sorts of changes the enhancements would include before its launch and schools were keen to be aligned with the IBO direction of travel. However, whilst schools were keen to discuss changes they had already undertaken, they did not want to discuss specific plans for the implementation of the enhancements. In four of the schools visited, the coordinator said that the following academic year would see the beginning of the introduction of the enhancements to the PYP, with a programme of staff development to be undertaken during that year (a year after the launch of the enhancements). In some of these schools, the coordinator has done the enhancements to the PYP Professional Development with IBO, the coordinator had participated in school group meetings about enhancements to the PYP and all the teachers had been part of meetings and discussions of the enhancements. Most of these schools had already undertaken aspects of school development related to aspects of the enhancements. In two other case schools, whilst applauding the move to formative assessment, the school had taken on testing regimes based on standardised testing, despite praising a formative approach. Clearly, action towards the enhancements to the PYP was not simple.

Schools did not implement the whole of the enhancements to the PYP uniformly, but chose those enhancements which were suited to their situation and trajectory of school development. This was shaped by a number of issues:

- The constraints upon curriculum planning experienced by the school. Some of the schools were committed to teaching both PYP and a local curriculum, making planning an onerous and detailed job;
- Working within a larger group of schools, not all of whom were IB schools, and sharing professional and school development goals
- Assessment regimes imposed locally or nationally, which were sometimes at odds with the PYP approach, but were important providers of information for parents and helped shape the curriculum;
- The point at which the school found itself in the accreditation cycle and whether they were likely to be accredited against the old or new guidance;
- Expectations of new Scope and Sequence documents. At least one coordinator explained that they were unwilling to re-plan units when a new Scope and Sequence document might mean they had to do this again when it appeared.

All the case study schools had used the enhancements to the PYP to instigate staff discussions about aspects of the enhancements with a view to school and professional development work. Some of these discussions had taken place during relatively informal staff meetings, some had involved staff identifying personal and school priorities for development, while some had led to a member of staff taking on a major project to develop an aspect of the school. However, where these priorities in school development plans depended largely on factors outside the control of IBO, schools were unsure about when they were expected to implement the enhancements to the PYP and to what degree.

Did case study schools view the changes as supportive of the implementation of the transdisciplinary framework?

All the teachers, coordinators and school leaders were committed to inquiry as the key approach to learning, through the transdisciplinary framework, although they did not all agree that the enhancements to the PYP had made the links clearer.

The teachers, coordinators and school leaders all said they saw the changes as supportive of the implementation of the transdisciplinary framework and only one coordinator, in one school, raised the possibility that teaching science and social science outside the TUI threatened the framework. Science was mentioned in a number of schools as something that teachers and coordinators had perceived as a weakness in the PYP and which would need to be supplemented with teaching outside the POI. In some cases, there were external drivers of this view, such as local curriculum specifications which had to be met (Canada) or local inspection arrangements which had to be observed (UK).

The coordinators and teachers particularly suggested that the flexibility of unit length; changes to planning formats and the reduction in the number of units for the Early Years classes would enable greater depth and relevance in the planning of TUI. However, there was also a general feeling, especially from school leaders that the IBO was showing it was more permissive and supportive of variety in school planning arrangements and this was welcomed.

School leaders and coordinators discussed the Programme Standards and Practices documentation and they wanted to have a clearer idea of what the new version might seek to identify as good practice. The coordinators and teachers would like to have a range of models of transdisciplinary inquiry. Some coordinators also discussed new Scope and Sequence documents, which they felt should have been released at the same time as the enhancements to the PYP to facilitate implementation.

It is impossible for teachers to say whether the enhancements to the PYP has supported the implementation of the transdisciplinary framework until a full cycle of the new planning arrangements has been evaluated. Indeed, it was surprisingly difficult to gauge to what degree students were already taught through transdisciplinary units and how far children were taught subjects like maths, English, phonics, etc. in each case. We saw some subject teaching in all schools and also additional EAL teaching for children in five of the schools. Generally, foreign language was taught separately and there was some degree of separate maths, English and, sometimes, science teaching. However, the arrangements were complex, with different degrees of inclusion (and some subtle mechanisms for linking subjects and units) in the transdisciplinary programmes, sometimes for different subjects in the same school. Teachers

were unwilling to talk about this issue. One interesting line of inquiry arising from this project is the very wide range of interpretations of what the transdisciplinary framework is, relative to a disciplinary framework and/or commercial subject teaching programmes.

- In some schools the transdisciplinary framework was entirely planned by the teachers in school, using Scope and Sequence documents and commercial materials, led by the coordinator, to address IB and local needs. Even in these situations there was some specialist subject teaching (language, phonics, maths)
- Other schools planned units to be led by PYP questions but to include content specified for Literacy and Numeracy and social science, from local curricula which were much more knowledge based (US).
- The degree to which the planning was done by the teachers teaching varied. In some schools, teachers planned all units from scratch. At the other extreme units were planned by coordinators across schools and adapted by teachers in each school using commercial programmes to include coverage of subjects like reading, phonics, social studies.

Coordinators and teachers would welcome more models of transdisciplinary units of inquiry and reassurance that there are many acceptable ways to manage them.

What were students' perceptions of the enhancements to the PYP?

Students were largely unaware of the enhancements to the PYP although they had noted some changes - particularly, in some schools, less emphasis on the Learner Profile and more emphasis on ATLs. The students were articulate about inquiry as a way of learning and the importance of cooperation and collegiality. When asked about agency, the students were able to identify opportunities in which they had had to make their own choices or take part in school operations. They were also keen to talk about action and share their experience. The Exhibition was one area where the students were aware of change, largely on the basis of comparing their experience of Exhibitions. They identified changes such as greater choice of topic, different categories of mentor or changes in the time when the Exhibition took place. None of the students found the changes in school unusual or disturbing and they were very creative in explaining the reasons for changes.

How had PYP schools and teachers attempted to inform parents about the enhancements to the PYP and how successful had these been in terms of keeping parents onside with developments?

The case studies found that parents were not aware of the enhancements to the PYP as a specific programme of curriculum change, but were aware of changes to the experience of their children, not all of which were related to enhancements to the PYP. For example, parents in the US case discussed changes to the timing of and mentors for the Exhibition and also the programme of IT replacement happening in the school. All of the parents we spoke to were confident that the extent and direction of changes would be managed by schools to the advantage of their children. They showed support for the school decision making.

Case study schools were not keen to share the enhancements to the PYP, lest parents question the motivation for changes. Instead they inducted parents into the gradual changes undertaken as part of enhancements to the PYP, through

routine meetings, information sheets and opportunities for parental collaboration already established as part of school life.

To what extent were the enhancements to the PYP perceived to address the objectives of the PYP review?

It is difficult to generalise about how far the enhancements to the PYP were addressing the objectives of the review that preceded them, but it is clear that, more than a year into its development, schools saw the review as positive guidance for school development related to some of the key principles of the enhancements to the PYP. The schools had identified particular aspects of the enhancements as the major principled changes and others as lower level or operational issues. These choices, however, were shaped locally as well as globally.

Were the enhancements to the PYP perceived to support transdisciplinary inquiry?

The PYP Coordinators, Teachers and Principals cautiously agreed that the enhancements to the PYP were likely to support transdisciplinary inquiry. Although they did not think the enhancements to the PYP made the links between disciplinary and transdisciplinary learning clearer, they did think that increased planning flexibility was likely to promote a balanced programme of subject and transdisciplinary inquiry. They were cautious, feeling that it was too early to be sure, and identifying the Scope and Sequence documents and the new Programme Standards and Practices as key documents in answering this question. The coordinators and school leaders wanted to know how to recognise new models of successful transdisciplinary inquiry and how far subject teaching would be acceptable.

Were the enhancements to the PYP perceived as easier for teachers to manage?

The Principal and PYP coordinators felt that, overall, the enhancements to the PYP offered more choice for schools and teachers, and so had the potential to be easier to manage. They emphasised the importance of flexibility in planning content into the units and flexibility in the length of the units. This ran alongside enthusiasm for this flexibility in reconciling the demands of local curricula and the PYP.

Were the enhancements to the PYP perceived as better addressing the needs of students?

The school leaders, PYP coordinators and teachers retained a strong focus on the needs of learners and found the enhancements to the PYP appropriately focussed on this. They were positive about the importance of students' voice and agency, and felt that increased flexibility would allow teacher to make the curriculum more relevant to individuals. The teachers, coordinators and school leaders were less concerned about pupil wellbeing and inclusion as specific enhancements, reporting that these were ongoing major concerns for their schools already.

How did schools perceive the mechanisms to assist them to learn about the enhancements to the PYP and the barriers to that process?

The case study schools gave valuable insights into the mechanisms and barriers to learning about the enhancements to the PYP. Although the enhancements to

the PYP were launched just months before some of the case study visits, it was clear that this was a well signalled reform which schools and coordinators were expecting. A good deal of preparatory work had been done by schools to align their school development with what they identified as the IBO directions of travel.

The broad strokes of the enhancements to the PYP were known by the coordinators before launch and had informed choices of focus for school development for more than a year. School leaders, coordinators and teachers all positively appreciated the opportunity to be ahead of the game and teachers and school leaders were enthusiastic about coordinators and teachers participating in the International Baccalaureate Educator Network (IBEN), because of the insider perspective this afforded the school.

The coordinators we spoke to had undertaken the IBO training for the enhancements to the PYP and saw it as their responsibility to introduce the key parts of the enhancements to their schools and teachers. Some of them saw it as their responsibility to share with the school leaders. The coordinators would like more examples of what some aspects of the enhancements to the PYP looked like - such as different approaches to transdisciplinary units of inquiry and examples of formative assessment. They reported regularly sourcing these from internet material provided outside the IBO. The role of PYP coordinator in schools is not uniform. In most schools the PYP coordinator was undertaking part of a homeroom teaching load whilst also coordinating the PYP. In other schools the PYP coordinator was a high status non-teaching role and in one school the role was taken by one person shared across two schools, who worked very closely with teachers and undertook demonstration lessons regularly. All the PYP coordinators supported planning of transdisciplinary units to a greater or lesser extent and managed PD for teachers.

School leaders worked in a variety of ways with PYP coordinators to introduce and manage the enhancements to the PYP. Some were very closely involved with the details of the enhancements and their implementation. Others focussed on managing competing policy demands, and the demands of school groups and did not engage with operational issues. However, two of the school leaders said they felt it was unfortunate that IBO had chosen to target training at PYP coordinators and that there were insufficient enhancements to the PYP training opportunities for principals and heads.

Schools had used a range of management and PD structures to develop understanding of the enhancements to the PYP and to identify priorities for school development, including PD. All had a senior leadership team which included the PYP coordinator and one school had created a special "Enhancements to the PYP Steering Group", which involved a large proportion of the teachers and which they reported was a very valued opportunity to take part in steering school development.

Coordinators undertook a variety of activities to promote the enhancements to the PYP

- All the coordinators had circulated written details (sent by IBO) about the enhancements, and discussed these in a meeting of staff (teachers and, usually, associated assistants, librarians etc.)
- Coordinators had participated in meetings of local PYP coordinators to discuss the enhancements. Some of these had been organised by the IBO,

some were part of a school district structure but most were informal support groups.

- Coordinators had led school-organised PD sessions for teachers in their schools to introduce the basic structure and scope of the enhancements to the PYP;
- Some coordinators had led similar training sessions to identify teachers' perceptions of which aspects of the PYP they saw as most important for the school and for their own professional development;

The ways teachers engaged with the enhancements to the PYP differed by school.

- In some schools all the teachers were very well informed and keen to look up the latest discussions among their peers, though they tended to name Facebook and non-IBO (or public access) resources.
- In other schools the teachers were content to rely totally on the coordinator to select what was relevant to them and present it to them
- In a few schools there was a mixed pattern of experimentation, where teachers were engaged in conversations and experimentation with aspects of the enhancements to the PYP.
- In some cases, another member of staff had accepted a role to lead development of an area related to enhancements to the PYP, such as reshaping the learning environment; reviewing assessments in school or trialling a new planner.

Structural features facilitated different patterns of engagement. In schools where teachers had a good deal of noncontact time for collaboration, and plenty of planning support they were more likely to undertake research. However, some of the greatest experimentation occurred in schools where a lack of time for collaboration was a key issue for teachers. In one school with a good deal of planning and support the teachers were very dependent on the coordinator. These different patterns of autonomy and agency reflect the discussions in the review of literature about cultures and structures in schools.

In the survey we asked teachers what would help them to implement the enhancements to the PYP. The cases produced rather different answers. Although teachers valued their PD, and would like more, in the cases teachers asked for more examples of what success in new areas like agency or formative assessment looks like. They would like to see a range of examples and discuss how to recognise success. They would also like, in most schools, more time to collaborate and contribute to the development of the enhancements to the PYP.

A summary of findings

This project was focused on the impact of a major set of changes to the PYP. The project derived data from:

- questionnaire responses from 1524 individuals, 50% of whom were PYP generalist or specialist teachers, representing 486 schools;
- 7 case studies of schools from around the world which taught the PYP.

In this section of the report we will summarise the main findings from these sources, presenting these as a bulleted list.

Questionnaire – main outcomes

Informed teachers

- Few of the respondents felt completely uninformed about the enhancements to the PYP and a surprisingly high percentage felt completely informed.
 - The most common way this awareness had been developed was through PYP Coordinators sharing developments with the teachers in the school.
 - Respondents were most aware of the enhancement of the role of play, and of agency as an important part of the enhancements.
 - Professional development workshops and school meetings were chosen as the most effective ways respondents felt they could be supported in the introduction of the PYP enhancements.

Responses to the enhancements

- In terms of making the PYP **better for students**, respondents were very positive about the likely effects in general, in particular the role of play as a vehicle for inquiry in the Early Years, but least enthusiastic about the re-positioning of the Exhibition, turning *PYP: Principles into practice* into an online resource and ceasing reporting on the LP.
- In terms of making the PYP **easier to implement**, respondents were very positive about the likely effects, in particular the idea that schools could determine duration and time frames of each unit of inquiry. They were least enthusiastic about the positioning of the Exhibition outside the POI or as a seventh unit, giving agency a central role in the PYP and action as an outcome of agency.
- In terms of making the PYP **more flexible for schools**, respondents reported being very positive about the increased flexibility the enhancements could confer, but least enthusiastic about the online resource, re-positioning of the Exhibition, giving agency a central role in the PYP and action as an outcome of agency.
- Changes to the PYP most welcomed were flexibility, agency, changes to the Early Years, changes to assessment, and use of planners.
 - Increased flexibility was seen as a welcome feature of almost all the enhancements, specifically: in using the planners; flexibility in Early Years provision; flexibility in the length and number of units; greater flexibility in teaching both transdisciplinary units and subject courses; flexibility in meeting the demands of local assessments and requirements.

- The idea of agency was widely welcomed and teachers clearly saw it as a really important feature of the enhancements.
- Respondents appeared to welcome all the changes to the Early Years, especially the change in the number of units and the emphasis on play.
- The comments about assessment broadly welcomed the introduction of formative assessment, not having to report the LP and a perceived reduction in summative assessment.
- The planner was mentioned many times, largely in appreciation of flexibility or difficulty of use of the old planner.
- Enhancements which caused concern were also those they welcomed most: agency, flexibility, changes to assessment, use of planners, changes to the Learner Profile.
 - Agency was identified as a concept causing concern. The many comments suggested teachers were simply not sure what agency meant in school contexts.
 - There were many responses about the possible practical difficulties of flexibility, rather than the impact of flexibility on the programme or philosophy
 - Many concerns focussed on assessment and teachers did not yet seem confident about what the enhancements recommended or what guidance was available to them.
 - The flexibility to use the planner was not universally welcomed and there was a feeling of fear about how this would develop.
 - Some respondents were concerned that not reporting the LP reduced its status.
 - There were a good number of comments expressing concern about the possibility of the Exhibition being reduced in status, not having time to prepare and not reporting the Exhibition.
- Responses concerning professional development opportunities asked, in short, for more of everything- especially face to face training, free and local to them. Some picked out particular topics (agency, action, planning, the Exhibition, metacognition, assessment, play) as good topics for professional development.

Case studies – main outcomes

- All the case study schools positively welcomed most of the enhancements proposed. The most mentioned headlines were agency and flexibility, with some emphasis on the changes to the Early Years age phase.
 - All staff had some awareness of agency and most knew it had been identified as a key IBO goal. The interviewees gave the promotion of student agency their support and enthusiasm.
 - Flexibility was discussed in a less specific way. In many of the cases, flexibility of unit length and timing was seen as a great advantage by teachers and coordinators and was identified as the most important aspect of flexibility, with the flexibility to teach outside the transdisciplinary framework the next most important aspect of flexibility.
 - All the PYP schools were aware of the enhancements to the PYP but there was a knowledge gradient from PYP coordinators to teachers in most of the cases.

- The change to the Early Years age phase was greeted enthusiastically by all the schools, at least in principle. The coordinators, Early Years teachers and school leaders all welcomed a recognition of the importance of play, which they felt IBO had been slow to foreground.
- Changes to assessment were welcomed by most of the teachers, leaders and coordinators, in principle, at least. They all supported increased formative assessment as a positive aspect of the focus on the learner.
- Other enhancements were seen as much more challenging, for a variety of reasons, but were nevertheless welcomed.
 - Agency was seen by teachers, coordinators and some school leaders as the most important and most challenging enhancement and one which was new, or at least clearer, to them as a priority.
 - The generally positive reception overlay a complex process of learning about and planning for change for schools to take on the enhancements. When a coordinator, principal or teachers were particularly enthusiastic about an enhancement it did not necessarily mean that actions had been taken, or were going to be taken, to make changes which addressed it.
 - One of the interesting features of the case studies was how often school leader, coordinators and teachers said they felt their school was ahead of the game. That is, the school had already undertaken school development work about aspects of the enhancements to the PYP.
- Discussions of actions taken to address the enhancements to the PYP were characterised by a contradiction. All the case study schools emphasised that it was very early days in the introduction of the enhancements to the PYP and that they had not had time yet to implement these fully. At the same time, all of them felt ahead of the game in undertaking school development related to the enhancements to the PYP.
- Schools were experiencing some barriers to change in terms of curriculum development. Some encountered in this project were:
 - The competing demands of local as well as IB curricula, especially where local curricula were knowledge based.
 - The assessment mechanisms and points imposed on school by school groups, states, national bodies or schools themselves.
 - The support mechanisms within schools, which could allow teachers to experiment or demand more compliance.
 - The amount of time for collaboration, which was seen as the most important barrier for many teachers in the case study schools.
 - Uncertainty about what success looks like – teachers cited a lack of models of transdisciplinary inquiry or agency for discussion by teachers.
 - Uncertainty about the timescale for implementation or the expectations presented by the Programme Standards and Practices.

Discussion of key themes arising

The questionnaires and case studies discussed above spanned a very wide range of schools, students and teachers. In creating a curriculum that is both global and local, teachers in IB schools were creating, rather than just delivering, a curriculum which was different in each school. The teachers in the case studies were well aware of this and, although they sometimes found the level of curriculum planning they undertook frustratingly high, they valued it as making their teaching more relevant to their students. In implementing changes to the PYP, these teachers and schools had chosen a range of different routes but had identified some very clear priorities from the range offered by enhancements to the PYP. There was also a very broad spectrum of knowledge about the enhancements to the PYP and this was related not only to the autonomy of the teachers but also the expectations of the schools about teachers' contribution to the direction of development of the school. However, this did not seem to be related to whether the school was part of a larger organisation or district, but more to the expectations of the teachers about their roles.

Outcomes from the sources of evidence that we used in this project, including the literature review, did overlap to a degree and in the following discussion we will report on an inductive analysis of the results of both the questionnaire survey and the interviews conducted as part of the case studies. which suggested a number of themes which appeared to be characteristic of many responses.

These are discussed further below and are briefly delineated here.

- Curriculum change and teacher development
 - Positive reactions to the enhancements
 - Ease of use
 - Flexibility of structure
 - Improved coherence
 - Streamlined day-to-day practices
- Enablers of change
 - Support to develop the enhancements to the PYP
- Barriers to change
 - Local curriculum demands
 - Local assessment requirements
- Features of the PYP
 - a) Inquiry-based learning
 - b) Agency
 - c) Transdisciplinary learning and teaching

Curriculum change and teacher development

A key message from the review of literature pertaining to curriculum development and change was that teachers are a crucial factor in educational change. Essential conditions for the sustainability of an innovation appear to be teacher support for the innovation, teachers' perceptions of the value of the innovation, and teacher professional development, and leadership approval. Such support must clearly be based initially on simple knowledge of the innovation and what it demands. The evidence from the questionnaire presented a positive picture in this regard in that it suggested that very few of the respondents felt completely uninformed about the enhancements to the PYP and

a surprisingly high percentage felt completely informed. Respondents were most aware of the enhancement of the role of play, and of agency as an important part of the enhancements. School leadership had clearly been important in this in that the most common way this teacher awareness had been developed was through PYP Coordinators sharing developments with the teachers in the school – a top-down, but apparently effective, means of developing teacher knowledge. All those teachers interviewed during the case studies expressed some awareness of the enhancements to the PYP but there was, probably inevitably, a knowledge gradient from PYP coordinators to teachers in most of the cases.

The developing teacher knowledge evidenced in both questionnaire responses and the case studies appeared to have been accompanied by enthusiasm among the teachers for the enhancements, with questionnaire respondents expressing generally positive views about them.

Positive reactions to the enhancements

In terms of making the PYP **better for students**, respondents were very positive about the likely effects in general, in particular the role of play as a vehicle for inquiry in the Early Years, but least enthusiastic about the re-positioning of the Exhibition, turning *PYP: Principles into practice* into an online resource and ceasing reporting on the LP.

In terms of making the PYP **easier to implement**, respondents were very positive about the idea that schools could determine duration and time frames of each unit of inquiry. They were least enthusiastic about the positioning of the Exhibition outside the POI or as a seventh unit, giving agency a central role in the PYP and action as an outcome of agency.

In terms of making the PYP **more flexible for schools**, respondents reported being very positive about the increased flexibility the enhancements could confer, but least enthusiastic about the online resource, re-positioning of the Exhibition, giving agency a central role in the PYP and action as an outcome of agency.

However, more in-depth inquiry through the case studies suggested that the generally positive reception overlay a complex process of learning about and planning for change for schools to take on the enhancements. When a coordinator, principal or teachers were particularly enthusiastic about an enhancement it did not necessarily mean that actions had been taken, or were going to be taken, to make changes which addressed it. Discussions of actions taken to address the enhancements to the PYP tended to be characterised by a contradiction. All the case study schools emphasised that it was very early days in the introduction of the enhancements to the PYP and that they had not had time yet to implement it. At the same time, all of them felt ahead of the game in undertaking school development related to the enhancements to the PYP. None, however, felt that they could simply proceed to full implementation without further professional development of their teaching staff.

Professional development of teachers can be a problematic concept and the literature on this topic tells us that teachers' professional development often does not actually meet the needs of teachers, principally because it can focus on knowledge transmission. Transmission models (e.g. training and cascade approaches) can often neglect to provide sufficient opportunities for teachers to focus on subject matter through hands-on practice, integrated into their daily classroom teaching. All educational institutions naturally have a strong interest

in developing the skills of their teachers, but they can only achieve this by working WITH these teachers in their development.

The questionnaire responses relating to professional development indicated that professional development workshops and school meetings were the most effective ways respondents felt they could be supported in the introduction of the PYP enhancements. Responses concerning professional development opportunities asked, however, for more of everything- especially face to face training, free and local to them. Some picked out particular topics (agency, action, planning, the Exhibition, metacognition, assessment, play) as good topics for professional development.

The priorities chosen by school leaders, coordinators and teachers were very focussed on the learner. Notions of learner agency, ATLs and formative assessment appealed to teachers who saw them as improving learning and empowering learners.

The teachers and coordinators had also chosen to focus on aspects of pedagogy which allowed them to shape their curriculum to the needs of their students- flexible planning formats and processes, units of different lengths and a wider range of (science) content, within and outside the transdisciplinary programme.

Although the schools emphasised that the implementation of the enhancements to the PYP was in its very early stages, the cases in this study included some schools which had engaged with some aspects of the developments for a considerable time. Other aspects of the enhancements to the PYP had attracted little interest, or were seen as low level and operational, and schools would not venture whether or if they would engage with these issues.

Ease of use

Making the PYP easier to implement effectively is a hallmark of the enhancements to the PYP. The flexibility at the heart of the changes was very much welcomed, partly as a way of mitigating the challenges all schools faced in various ways of balancing IB requirements with local or national imperatives. The UK PYP coordinator summed up this tension:

I think that [the enhancements] do allow us to reflect our context in a slightly more authentic way rather than feeling like you are sometimes slave to two masters in some ways and you are trying to fulfil different requirements.

In some case study schools, teachers appreciated the new sense of flexibility but were yet to exercise these freedoms. In others, a conscious decision had been made to retain some former ways of working and not to make some permitted changes, on the basis of professional judgment. As the PYP coordinator in the Middle East put it:

Why do we need to change it? So we are trying to think of things this way. What works for us as a school? What was working well? What actually gives us the opportunity to think further?

All of these responses are consistent with the micro, meso and macro levels of change identified by Fullan (2001). One impetus for change comes from the macro level of external 'masters' to be served; at the meso level, school-wide commitment to meaningful change is important; at the micro level, buy-in from

individual teachers remains crucial too. Effective change depends on success at all these levels.

Flexibility was experienced in a number of ways in the case study schools. Broadly speaking, this might be categorised as: flexibility of structure; improved coherence and streamlined day-to-day practices.

Flexibility of structure

Flexibility regarding transdisciplinary teaching is discussed elsewhere but this development appeared in other forms. Most schools were very positive about the opportunities for adaptations such as year-long units and freedom relating to the timing of the Exhibition. In the UK, this latter development, for example, was seen as creating a more meaningful learning experience:

Changing the Exhibition from being... it is not going to be a summative culminating project necessarily. And having that potentially outside the programme of inquiry, I think that it gives a lot more scope to make sure that it is, that it is the best fit for the students within this context

Some had already exercised these freedoms (e.g. Scandinavia had moved the Exhibition to the fourth unit of inquiry) while others were yet to do so. Another well-received change was the opportunity for fewer units of inquiry in Early Years, along with the extension of this phase to age six.

Improved coherence

A perception of improved coherence was seen, for example, in the renaming of Transdisciplinary Skills to Approaches to Learning. There was near-universal approval of the way this 'common language' (East Asia) aligned with the MYP terminology, allowing smoother transition between phases. As the coordinator in the Middle East put it:

ATLs have also tried to make that transition smoother across the school and I like that and now that the enhancements have given the school the flexibility to add or sort of just name the sub skills according to what we feel we need as a school.

One dissenting voice, however, came from the Australian school, where the new terminology was not seen as appropriate:

I detest the fact that the 'transdisciplinary skills' have been named 'approaches to learning' in order to fit in with the other programmes because they are not approaches to learning actually and they are transdisciplinary skills

Streamlined day-to-day practices

From those who had begun to use it, there was general approval for the new electronic resource, ranging from cautious optimism (Australia) to enthusiastic praise (Scandinavia). In the Middle East, one teacher explained:

It is just one simplified document for all these points that you have to get across to ... and it makes it easier to know that ... this is what the PYP looks like in a school and it has made it easier that they have combined and created this document for us as teachers.

However, in some schools, it seemed that a transition to this might take time, as in East Asia, the USA and the UK, where this had not yet been engaged with by teachers and in Canada, where the coordinator said:

I think that the teachers work materials are great and I don't know if any of our teachers know that they exist. I do have a hard time getting people on to MyIB to look at all that stuff.

The freedom to create a new planning format was also welcomed but, apart from at the Australian school, this had so far not been widely implemented. In Canada, for example, the school was 'holding off' to see if there were any further developments. It was clear, however, that the previous format was not popular. In Australia, it was claimed that the majority of teachers disliked it because: '*it is not intuitive and it is not actually useful as a planning document and it is a box ticking exercise.*' In the UK, the move from compliance to 'messy', but productive thought, enabled by this change was emphasised:

It felt like a compliance thing and it was like let's all sit around a computer and think about what we are going to write in this box. Whereas now our planners are kind of messy and they reflect the learning that is happening and the teachers have had a say.

Flexibility, therefore, was welcomed as a means of making the PYP easier for teachers to implement but each school was making its own decisions about which changes were right to make, occasionally on the basis of entrenched staff practices, but usually on the basis of local professional judgment.

Enablers of change

In the review of literature, we identified a number of approaches to curriculum change as top-down and bottom up approaches, long-critiqued as rather simplified models (Kelly, 2010), and process models which are a dynamic response to student needs. The snapshot of implementation of the enhancements to the PYP taken in this project shows features of all three approaches to curriculum change. The enhancements were seen by case study school teachers and leaders as mandated by IBO and they felt they had been directed to introduce certain curriculum changes, and would be accountable at the next re-accreditation. However, the nature of the enhancements, and particularly the key philosophical ideas such as agency and changes to planning the transdisciplinary framework, were ideas that school leaders and teachers felt they owned and had made significant progress in incorporating into their curriculum. They recognised these ideas as desirable targets identified by IBO as important to the enhancements to the PYP, and felt they were ahead of the game in having taken on these ideas in their schools.

Support to develop the enhancements to the PYP

The most obvious enabler of enhancements to the PYP implementation was learning about the enhancements to the PYP by teachers and school leaders and how they were supported to integrate enhancements to the PYP in school curricula.

As Guskey (2000) noted, curriculum development, new plans and changes to improve teaching and learning in schools, demand high quality PD for teachers and time to integrate new knowledge and skills into their curricula. The implementation of the enhancements to the PYP was supported by the IBO's own

training for schools and teachers. This included sharing information at PD (conference type) sessions, running specific PD workshops (some online) for PYP coordinators and regular mailings. Aspects of this are classic cascade or training approaches- both top down approaches to professional development, which are cost effective and give the PYP coordinators the advantage of being both learner and trainer, reinforcing their expertise and giving them opportunities to address the ideas in a variety of contexts (Wedell, 2005). Teachers in the case study schools certainly appreciated this training.

However, as Gonzalez (2007) noted, cascade training can have limitations when the cascade of knowledge is reduced to a trickle and there was a wide variation in the knowledge of teachers between different schools, which planned PD in different ways and offered different opportunities and timescales. Teachers and school leaders in case study schools overwhelmingly appreciated the top-down provision and it was jealously sought by schools.

The knowledge gradient it created was an issue in some schools, where for example, a headteacher felt the school leaders should have been trained first or where teachers were very dependent on their coordinator to lead, plan and manage introduction of changes - almost to the point where they did not engage with changes unless this was managed for them. The literature has noted that a top down approach alone is unlikely to result in longer term, beneficial change in teaching practices (Nzarirwehi & Atuhumuze, 2019). In most of the case study schools there were clearly other approaches to PD at work simultaneously. Teachers discussed longer term projects to address flexible learning spaces in the US, UK and East Asia. One school had created more flexible Early Years spaces, additional maker-spaces and targeted support for teachers to introduce technology. These innovations were seen to be a product of school-led innovation by the teachers and school leaders, but were also key parts of the IBO strategy for enhancements to the PYP.

In addition to either top down or bottom up PD, teachers were engaged in experimentation in some schools- either individually or in groupings within the school structures. This sort of experimentation demands a degree of flexibility in the management and monitoring of curriculum delivery within the school and might not be possible in all schools. It also demands confidence and inquiry on the part of the teachers and some schools promoted this more than others, in terms of how they welcomed and shared innovations.

The management structures within schools and structural arrangements for professional development and for curriculum change, were both barriers and enablers for the enhancements to the PYP. Each school had different management structures with different degrees of school independence. Some structures were very well established. For example, in the USA, where most of the school district were implementing the enhancements to the PYP, the PD structures and curriculum planning were led above school level by a curriculum lead working with PYP coordinators who worked across schools. These coordinators worked with school principals and teachers but the principals did not lead the curriculum changes. This arrangement had evolved to meet the needs of the district and had the confidence and support of teachers, principals and consultants. Principals felt it allowed the PYP coordinators to be more focussed in their PD and to support the teachers best and teachers agreed with this. The school, however, managed working patterns and the time available to PD, and coordination between teachers.

An example of a school where the enhancements to the PYP had led to new structures for change was the Middle East Case. In a school with a large, stable and largely local teaching force, a central team of 27 teachers were selected as the 'enhancements to the PYP steering committee' to lead developments for the PYP by cascading information about the enhancements to the PYP and working on changes to the curriculum. The teachers who were part of the steering committee were extremely well-informed about the enhancements and very positive about their potential in their school, not only for the effects on the curriculum, but also because this was promoting their involvement in curriculum change, for the first time. The new committee promoted discussion, change and, most significantly for the teachers, involvement in that change.

This sort of support was found to be particularly enabling by teachers, who said they were confident in delivering the enhancements to the PYP approach to technology. Indeed, time to collaborate with other teachers was probably the issue most often identified by teachers as necessary for them to implement the enhancements to the PYP and it is something Savage and Drake (2016) found to be one of the most important aspects of enacting a transdisciplinary framework.

For example, in East Asia, mechanisms to develop technology teaching included not only improved facilities and additional technical staff to support the teachers but also specific time for teachers to learn about the technology, within the working day, in preparation for teaching the following term. Teachers mentioned time for collaboration with colleagues as an enabler or limitation on enacting changes more than any other issue in the case studies. For example, teachers in Canada noted that there was never enough time for planning, curriculum development and reflection and that this limited innovation.

This was also discussed by the teachers in the USA, although they wanted collaboration time led by the coordinator, rather than time to meet amongst themselves. Although time for collaborative planning and reflection was clearly a key enabler of change for these teachers, it was not something teachers identified under the open questions in the survey.

Barriers to change

Schools were experiencing many barriers to change in terms of curriculum development. Some of those encountered in this project were:

- The competing demands of local as well as IB curricula, especially where local curricula were knowledge based.
- The assessment mechanisms and points imposed on schools by school groups, states, national bodies or schools themselves. These could shape not only the curriculum but also the year.
- The support mechanisms within schools, which could allow teachers to experiment or demand more compliance- a top down or bottom up approach.
- The amount of time for collaboration, which was seen as the most important barrier for many teachers in the case study schools.
- Uncertainty about what success looks like – teachers cited a lack of models of transdisciplinary inquiry or agency for discussion by teachers.
- Uncertainty about the timescale for implementation or the expectations presented by the Programme Standards and Practices.

Local curriculum demands

Many of the schools included in this study were expected to teach a curriculum based on the enhancements to the PYP but also taught the content of local curricula mandated by national or local governments, or by schools' organisations. Each school was different not only in formal local requirements but also in the degree to which they prioritised these in the context of the IB PYP.

In East Asia and the UK, the school taught only the PYP. In Scandinavia the local education authorities had recently made changes and accepted the PYP as a full curriculum which met the national requirements of a suitable curriculum. The focus on the PYP enabled these schools to focus on introducing the enhancements in ways that worked for their students without concern for its effect on other structures or accountabilities. Indeed, the PYP coordinator in the UK said she would like to have a more specific set of Scope and Sequence documents which left less scope for variety.

In some schools, such as Canada, the school was required to teach most of the subjects in the local curriculum as well as the Transdisciplinary Framework and Scope and Sequence documents. Other schools were required to teach certain subjects, such as the common core of literacy and maths in the United States and the state requirements for social studies and science. The teachers and coordinators were cautious about re-planning units of inquiry because they needed to ensure that the local curriculum coverage was appropriate. The degree to which non-IBO curriculum requirements affected the implementation of the enhancements to the PYP depended on the philosophical basis of the local curriculum requirements and how well aligned this was with the PYP. Where the local curriculum was knowledge-led, the close specification of what knowledge students should learn was not as compatible with the inquiry led approach of the PYP. In schools where particular knowledge was specified for a particular grade, such as the social studies in the USA, the schools did a very careful planning audit to ensure that specific topics were part of particular transdisciplinary units. In other schools the teachers recognised that they were meeting the demands of a local curriculum but found it easier if the curriculum was inquiry led and more similar to the PYP, although teachers in Canada, an example of this, still identified items of content which had to be taught outside the programme of transdisciplinary inquiry for this reason.

One example of mismatch between the enhancements to the PYP and national educational norms was in Scandinavia, where children do not start school formally until 7, raising the challenge of enhancements to the PYP covering the Early Years when these children would not be at school normally. This had brought challenges around funding and assessment, for example.

The intention is to be able to expand it to three year olds but at the moment we do not have anywhere to place all of them and in [City] it is different administrations for the younger ones and they belong to preschool .. yeah .. and so at the moment the city is discussing who is to pay for these kids and so until they actually come up with who is paying .. we get the five year olds.'

Local assessment requirements

In addition to the requirements of local curriculum documents, some schools also had to meet local assessment requirements, or had chosen to undertake

assessment systems as part of their school group. These assessment requirements were a strong determinant of curriculum in classic washback effect terms. Where students were required to undertake standardised tests or national assessments, the teachers were naturally keen to teach a curriculum which enabled students to perform well on these assessments. For example, in the UK, one headteacher was doubtful that an additional year of Early Years provision would be compatible with the high stakes tests set by the school group which owned the school. She felt that to do well in these tests the students needed the formal teaching already provided in the year before the tests and that making this another year of play based learning would adversely affect the school's test results.

This did not affect all schools - the East Asian school we visited assessed towards the PYP requirements only. However, even schools which did not teach a local curriculum had sometimes chosen to participate in standardised or other types of assessment events. The UK school had introduced standardised tests and participated in the local standardised assessments, which were voluntary. In Australia all schools had to undertake the national assessments of literacy and maths and in the USA the state was in the process of introducing computer-based standardised assessments. Staff in all these schools recognised the value of comparative data about their students' performance but the timing and nature of the assessments shaped the curriculum. For example, in the UK, the Headteacher told us that extending the EY by a year would be difficult because of the high stakes tests. The teachers felt that preparation for such tests was important.

Features of the PYP

a) Inquiry-based learning

The PYP is a curriculum whose distinctive characteristic is its engagement of pupils in inquiry-based learning which situates learning in problem-solving. Recent research findings in the learning sciences suggest the effectiveness of a constructivist, inquiry-orientated view of learning. Much of the power of this approach to teaching and learning lies in its potential to increase student engagement and deepen understanding through developing a collaborative approach to learning, which in turn has been shown to evoke clear positive effects on three principal categories of outcomes: achievement, attitudes and perceptions. Contemporary inquiry-based methods involve high levels of scaffolding for pupil learning, meaning the question is not so much whether inquiry-based learning per se is useful, but rather in what conditions can inquiry-based learning be most effective.

The questionnaire responses, while not focusing per se on inquiry-based learning, did show a broadly positive view of the linked issue of formative assessment and a perceived reduction in summative assessment. This view was echoed in the case studies where changes to assessment were welcomed by most of the teachers, leaders and coordinators, in principle, at least. They all supported increased formative assessment as a positive aspect of the focus on the learner.

It was, however, pointed out by several interviewees in the case study schools that the assessment mechanisms and points imposed on school by school groups, states, national bodies or schools themselves were sometimes at odds

with the formative assessment emphasis which tends to be linked to an inquiry-led approach. This potential clash of approaches was also linked by several interviewees, as discussed above, to the competing demands of local and IB curricula, especially where local curricula were knowledge-based.

b) Agency

Human agency is the potential of people to act upon their world purposefully, in situations where it is possible to take different courses of action. A key feature of an IB philosophy, especially crucial in the PYP, is that learners need to be seen as decision-makers rather than just repositories of knowledge. The review of literature outlined research that had examined efforts to increase student voice and agency at the classroom level and found that students improved academically when teachers ran their classrooms in ways that valued student voice.

Based on the work of Bandura (1997, 2001), especially in relation to self-efficacy, the IB characterises agency in terms such as student initiative, responsibility and ownership in relation to learning (IBO, 2018). The concept and implementation of agency in the PYP gave rise, however, to some mixed responses in both the questionnaire and the case studies. Responses to the questionnaire indicated that the idea of agency was widely welcomed by respondents, who clearly saw it as a really important feature of the enhancements. On the other hand, agency was identified as a concept causing concern. Similarly, in the case studies, all staff interviewed had some awareness of agency and most knew it had been identified as a key IBO goal. The interviewees gave the promotion of student agency their support and enthusiasm. Nevertheless, agency was seen by teachers, coordinators and some school leaders as the most important and most challenging of the enhancements and one which was new, or at least clearer, to them as a priority.

A commitment to curriculum with the student at its heart was evident in this response from a teacher in Australia, for example:

So we had two years ago that the focus was to start with the child, which sounds ridiculous when you work in a school. But amazingly many schools - and in our own case there are many things - where the decisions do not start from the child and they start from the curriculum or the timetable and the government requirements.

As a result, agency was widely described in terms closely resembling the IB's trio of 'voice, choice and ownership' (IBO, 2018). For example, in East Asia, agency meant that '*learners can have their voices heard and recognised and acknowledged because the learning is about them*', in the Middle East a key question was '*how do we help them be owners of their learning and of their school environment and their wellbeing?*' while in the USA agency was '*the opportunity for the students to create, build and then have that investment in whatever it is that you are doing*'. The PYP Coordinator in the UK case, however, was keen to emphasise that a balance needed to be struck:

When you first look at it, it can seem like it is all about the students running the curriculum and actually it is not. It is more about students having a clearer voice in directing where things are going and perhaps leading the inquiry rather than the teacher always leading the inquiry.

Examples of creating opportunities for student agency were plentiful, often cited either as the driving force behind subsequent action or in terms of ownership of learning. They were conducive to the characteristics of agency identified by Bray (2017), such as setting goals, selecting tools and being proactive. The examples included: decision-making about outdoor play equipment (East Asia); involvement in a 'safety patrol' (USA); charity work through a 'care group' (Middle East); designing classroom layouts (Canada) and supporting learners across age groups (UK). In places, there had been ambitious examples of ownership, such as in East Asia, where students had been heavily involved in the planning of units of inquiry (through a process of class representatives soliciting classmates' views beforehand and then meeting with teachers) and in writing their own report cards. All of this closely resembles the 'competence' model of pedagogy identified by Hempel-Jorgesen (2015), in which trust and student initiative are prized.

While IB documentation focuses chiefly on student agency, it was clear that staff teams had extended the principle to themselves as educators. Teacher agency was important at classroom level in Canada where, for example, a teacher claimed:

Teacher autonomy has grown a lot and I feel that when teachers feel like they have power and control to do what works for them in their classrooms people not only are more committed to the programme but I think that people actually see how it can really work for a diverse school with a lot of learning needs.

This extended to the very implementation of the enhancements. While in some places, such as the case study schools in the USA and UK, the PYP coordinator had retained strategic control, elsewhere, agency had been extended to involving teachers in aspects of leadership and decision-making.

While agency was certainly high on the agenda in all schools visited, it was much less clear that these examples were *new* developments as a result of the enhancements to the PYP; rather agency seen as something to build on and grow. In the Middle East, for example, it was something that '*will continue to challenge us as a school and push our thinking forward.*' If agency was not a new concept for these schools, therefore, it is important to consider the extent to which its enhancement had in fact led to any early *changes* in thinking or practice.

One of the most notable developments as a result of the enhancements seemed to be in a new sense of clarity and purpose. In some schools, a shift from implicit to explicit consideration and articulation of agency was evident. Some felt that this had always been a feature of practice but that the use of the term was new, as seen in one Australian teacher's comment:

We didn't really call it agency. It was not a buzz word and we called it ownership and in fact we had a (professional development) focus four years ago on encouraging students to take more ownership and so there are things that we had already been addressing and we are like, oh, it is in the enhancements and we are already doing that

For others, this was more about a shift of emphasis. In the UK, one teacher referred to seeing how '*using a new term with a different emphasis changes what we are looking for in terms of action for students*', while the principal in East Asia stated:

I have felt that the agency it was definitely there but I had to kind of, I had to extrapolate and I guess add some of my own interpretation and link it with some other research for it to be as explicit as I felt that it was ... but I love now that it just that it is now centre stage.

Beyond these individual reflections, it also seemed that the focus on agency had led to some powerful professional learning across schools. Agency in the UK Case had been a 'big discussion' among staff, while in Scandinavia, the coordinator referred to discussions being 'energised' by this enhancement. Similarly, in the Middle East, the PYP coordinator explained:

The biggest [change] that I see is allowing us to have and to really have those conversations about the practical aspects of learner agency and it is not that we were not able to have them before but having something that is really clear and formalised in our curriculum framework is helpful.

These new conversations had also allowed teaching staff to begin to think about and enact principles of agency in low-risk ways. This potentially allows for a safe space for the kind of intentional design referred to by Bokas and Rock (2015). In the UK, for example, the coordinator explained that teachers had been able to 'have a go at doing different things in a sort of relatively controlled way', due to the focus on learning.

It seems, therefore, that while the re-positioning of agency may not yet have led directly to substantial changes in *practice* at the time of the questionnaire and interviews, this enhancement had done something potentially more powerful. It had focused teaching staff on agency at a metacognitive level, the importance of which has been noted by Flavell (1979) and others. It seems important now for these discussions to extend to students themselves to enhance generative self-regulation processes with implications for lifelong learning and action (Ferguson et al, 2015; Manyukhina and Wyse, 2019). There were signs already that students in some schools were able to discuss agency articulately, hinting at the potential for a deep understanding of the idea. In East Asia, examples of ownership of learning were given:

They are letting us enquire a lot more than we usually do. Like the learners and letting us do a lot more take a lot more responsibility for our action and do stuff by ourselves and like key concepts and stuff and the lines of inquiry and stuff. And the central ideas and you have to make your own lines of inquiry and make your own central ideas about your topics.

In the Middle East, one student's response even referred to the IB's own, three-part terminology:

Agency goes with everything because it is ownership, voice and choice and so everyone has to have a voice and have ownership and have a choice and feel that they belong to the school.

However, these were quite unusual examples. In most cases, students' discussions focused on specific actions and did not often recognise the concept of agency explicitly.

Despite the universal enthusiasm for agency as a central guiding principle, there was also some acknowledgment of the constraints involved, in line with the notions of 'structured' and 'bounded' forms of agency (Shanahan, 2000; Evans,

2002). Some of this centred on the demands at classroom level of maintaining purposeful direction while relinquishing some control over the students' learning in the name of authenticity. As a Canadian teacher put it: *'I guess that there is a sense that if it is driven by the teacher then to me that is not authentic action'*.

As well as these concerns over control and rigour, creating student agency depends upon considerable pedagogical skill and judgment. The fact that much of the research on agency (e.g. Toshalis and Nakkula, 2012; Rudduck & Flutter, 2000) has focused on older students may hint at the challenges for the primary phase. In Scandinavia, one teacher shared her own doubts: *'I panicked a little bit because. Oh my god how am I going to do this with six-year olds?'* Meanwhile, for her PYP coordinator, this had raised the question of whether all teachers were capable of this, a question with implications for CPD:

I think that it can be very hard for everyone to do it ... at this school I see so many good teachers that I know can definitely bring in agency into the classes but I do think also that it brings a certain kind of teacher in order to get that correct and so it just becomes chaos.

Parents, while broadly supportive of this aspect of the PYP, expressed their own worries about excessive agency. As a Canadian parent put it: *'when you think about it, it makes sense, but it is always whether or not that is going to work!'*

In summary, then, the positioning of agency at the heart of the enhancements to the PYP was a very welcome development. While this had not led to a significant change in practice, it had led to some reappraisal and energising, productive debate. Many respondents seemed to conflate agency and action. While action is 'the core of student agency' (IBO, 2018), this enhancement may lead to a greater understanding of agency in its own right, as the basis for more authentic action. Increasing student agency involves a process of relinquishing control, which can be challenging and PYP coordinators are critical for establishing teacher confidence and empowerment.

c) Transdisciplinary learning and teaching

There are three possible orientations to the integration of curricula: Multidisciplinary, Interdisciplinary and Transdisciplinary. The IB PYP is specifically described as transdisciplinary "to convey learning that has relevance across the subject areas and more importantly, learning that transcends the confines of the subject areas to connect to what is real in the world" (IBO, 2010, 1).

One study of the experiences of PYP teachers as they implemented a transdisciplinary curriculum (Savage and Drake, 2016) found that these teachers tended to view transdisciplinary teaching and learning as a framework within which to work which was flexible and adaptable to different contexts and cultures. This echoes the outcomes of the questionnaire in which increased flexibility was seen as a welcome feature of almost all the PYP enhancements, specifically: in using the planners; flexibility in Early Years provision; flexibility in the length and number of units; greater flexibility in teaching both transdisciplinary units and subject courses; flexibility in meeting the demands of local assessments and requirements. In the case studies, flexibility was discussed in a less specific way. In many of the cases, flexibility of unit length and timing was seen as a great advantage by teachers and coordinators and was identified as the most important aspect of flexibility. However, the flexibility to teach outside the transdisciplinary framework was the next most mentioned

benefit of flexibility, which can be read as somewhat contradicting the general acceptance of transdisciplinarity.

All the teachers, coordinators and school leaders visited in the case studies were committed to inquiry as the key approach to learning, through the transdisciplinary framework and this is central to the PYP philosophy. Many of the teachers and coordinators expressed positive commitment to the central place of transdisciplinary inquiry as IB philosophy. For example, in Australia:

transdisciplinary inquiry is fantastic. My kids don't know if they are doing social studies or languages or arts or science ...

The teachers and heads discussed the transdisciplinary framework in both theoretical and practical terms. In theoretical terms they discussed how the transdisciplinary framework focussed on the importance of concepts, of skills and authentic learning.

However, some of the teachers who had recently moved to teach IB said they found the approach unfamiliar. As Levin and Nevo (2009) note, it can challenge the core beliefs of teachers who have learned and taught in a more disciplinary manner. These teachers also discussed the importance of learning from colleagues and researching the approach themselves. Their colleagues welcomed the enhancements as opening up discussion about transdisciplinary learning and refreshing their interest.

There were some critical comments regarding a transdisciplinary curriculum, both in the questionnaire responses and the case studies. These mostly focused on the possible practical difficulties of flexibility, rather than the impact of flexibility on the programme or philosophy. What became clearer in the case studies was a general uncertainty about what success would look like – teachers cited a lack of models of transdisciplinary inquiry which they could discuss or react to. This links to the further findings of Savage and Drake (2016) that teachers positively disposed towards transdisciplinary teaching and learning had time to meet with each other to plan the work, and not only at the beginning of a year or term, needed large blocks of time during the school day to be devoted to transdisciplinary teaching and learning as opposed to strict timetabling, and needed everyone, including school management as well as teaching colleagues, to 'buy in' to the program.

The transdisciplinary framework in action

In practical terms, as Grady (1994) pointed out, a transdisciplinary approach to curriculum *is the most complex to design, develop and carry out, particularly in a traditional setting*. Each case study school visited addressed managing the curriculum through both transdisciplinary units and subject teaching outside the units. Each school took a different approach but all taught mathematics and foreign language outside the programme of inquiry. Overall, teachers in all the schools viewed the transdisciplinary units as the heart of the students' learning and aimed to maximise links and connections even where 'subject teaching' took place. Reasons for teaching outside the POI were conceptual, curriculum content related, pedagogical and practical. In conceptual terms some subjects had disciplinary continuity which the school aimed to maintain, even when this was not the focus of the current unit. All the schools we visited told us about the need to teach maths and phonics in a continuous and progressive programme

and most schools had commercially prepared programmes to do this, though some used these flexibly.

Three of the head teachers and one of the coordinators welcomed the chance to teach more science outside the units of inquiry because they identified science as a weakness of the existing PYP. One UK coordinator noted that *"because of the greater freedom... we have got the scope to bring in a very robust STEM (Science, Technology, Engineering, Mathematics) programme and we now have the freedom to do that."*

Additional curriculum content or assessment requirements placed on schools by local curricula or assessment regimes were another reason given for choosing to teach some aspects of the curriculum outside the POI. In some schools, particular content had to be included in certain year groups, even where it did not fit naturally into a particular unit. For example, in Canada aspects of Chemistry had to be taught separately to address the provincial curriculum and in the US, aspects of social science had to fit into the programmes of study within certain year groups. In some cases, this was because a knowledge based local curriculum was being adapted to fit into an IB philosophy. However, even where the local curriculum was conceptually led, as in Canada, there were still aspects which had to be taught separately.

The choice to teach particular subjects was also based on pedagogical issues such as timetabling, use of specialist teachers or pedagogical differences between the approaches to teaching employed in some subjects. This was particularly true of languages where there were differences of approach between languages specialists and homeroom teachers in the schools in Australia and East Asia.

It was also the practice when art, technology and PE required specialist timetabled equipment. However, schools were committed to making and improving links between homeroom and specialist teachers, and viewed the enhancements as giving them a mandate to discuss new ways of working and building connections.

Flexibility in operating the transdisciplinary framework

Most teachers were enthusiastic about the perceived freedom offered by the enhancements to the PYP in terms of teaching subjects outside of the programme of inquiry. Sometimes this was seen as legitimizing approaches which had already been taken, such as teaching mathematics outside the units. In other cases, this was about meeting the particular needs of the school or student body. Others welcomed particular enhancements which made the transdisciplinary units more flexible, notably the option to vary the length of units and cover units in innovative ways. For example, a school leader in East Asia said:

It opens up discussions and possibilities because really now with the flexibility in the way that you could structure the POI and even the lengths of the units of inquiry .. is much more open in terms of it .. you know .. in comparison to what it used to be or how people used .. or how schools used to perceive it.

Some case study schools had already experimented with integrating transdisciplinary units. Others had identified the possibility of doing year-long units and units which might be revisited. Yet other schools discussed year-long

units as ways to offer subjects like phonics, which needed to be taught regularly, even daily to some children.

Planning transdisciplinary units

The sense that the enhancements to the PYP offered a wider range of possibilities and supported discussion about innovation was evident in the teachers' discussions of the changes to planners and planning. All the schools identified new planners and planning as making a positive contribution to the transdisciplinary framework. The old planner was clearly unpopular. As one UK teacher noted:

I think probably the single biggest frustration in the past has been with the planner ... (so) they have given everyone the autonomy to create their own planner which is you know .. great .

Teachers and leaders discussed the creation of new planners enthusiastically. Some schools were making changes to the planner incrementally. In the USA, for example, ATIs had been included and teacher attention had focussed first on planning these. Alongside the quality of discussion, teachers had identified the opportunities for collaboration between teaching year groups, homeroom and specialist teachers, and across grades as the big advantage of creating new planners. This teacher in East Asia explained that they saw this as one of the most important aspects of the enhancements to the PYP.

I know the specialist teachers do get particularly frustrated when sometimes they can see things that they would like to do but they have not had the time to really sit down and talk it through and kind of go through what might work and how things could work with the home room teachers.

Collaboration was a key issue for the teachers both in implementing the enhancements to the PYP and in supporting the transdisciplinary framework.

Threats to the transdisciplinary framework.

Not every teacher reacted positively to aspects of the enhancements to the PYP and some aspects were considered a threat to the transdisciplinary framework. The open questions in the first survey asked teachers about their concerns and suggestions that there were some threats to the transdisciplinary framework emerged as a moderately sized theme in the responses, with 24 expressions of concern and 14 comments specifically welcoming changes.

The concerns were around the flexibility to teach outside the framework, the use of specialist teachers and whether flexibility might weaken of the integrity of the framework.

The flexibility to teach science and social studies outside of the units of inquiry. Where there are specific regulations set by a country, I can understand why this change is necessary. However, for schools where there is not that concern, I would be concerned that the transdisciplinary nature of the PYP could be compromised.

The teachers in the case studies were largely positive about the effect of the enhancements to the PYP on the transdisciplinary framework, but some did express serious concerns:

When I went to the conference and they talked about that and there was a bit of an uproar in the room .. and I was like. What?! Isn't that compromising the integrity of the programme? Because ... maybe something like ... like PE? Perhaps? Something that ... is important and you are going to do it anyway and it does not link authentically then do it outside. But science and social studies there is no reason why there should not be within and so that was a surprise.

On the other hand, most teachers expressed confidence that the transdisciplinary nature of the curriculum would not be compromised but that increased flexibility was welcome.

Transdisciplinary skills and ATLS.

Most teachers welcomed the use of a term (Approaches to Learning - ATL) also used across IB programmes (MYP, DP and CP), especially in the continuum schools, although there were a number of teachers who felt that the term *transdisciplinary skills* was important in itself in promoting the Transdisciplinary framework and IB philosophy.

However, there was overwhelming support for attention to ATLS in planning the transdisciplinary framework because teachers believed that students' reflecting on and being aware of their approaches to learning was an important part of agency and awareness of learning in their students.

The transdisciplinary framework overall

The coordinators and teachers would like to have a range of models of transdisciplinary inquiry. Some coordinators also discussed new Scope and Sequence documents, which they felt should have been released at the same time as the enhancements to the PYP to facilitate implementation. School leaders and coordinators also discussed the Programme Standards and Practices documentation and they wanted to have a clearer idea of what the new Programme Standards and Practices might seek to identify as good practice.

It was impossible for teachers to say whether the enhancements to the PYP supported the implementation of the transdisciplinary framework until a full cycle of the new planning arrangements had been evaluated. Indeed, it was surprisingly difficult to gauge to what degree students were already taught through transdisciplinary units and how far they were taught subjects. One interesting line of inquiry arising from this project is the very wide range of interpretations of what the transdisciplinary framework is, relative to a disciplinary framework and/or commercial subject teaching programmes.

In some schools the transdisciplinary framework was entirely planned by the teachers in school, using Scope and Sequence documents and commercial materials, led by the coordinator, to address IB and local needs. Even in these situations there was some specialist subject teaching (e.g. language, phonics, maths).

In other schools, units were planned to encompass the PYP and a local curriculum which was also inquiry led, but still had some required content and assessment requirements (Canada) and some areas of discrete subject teaching.

Other schools planned units to be led by PYP questions but to include content specified for Literacy and Numeracy and social science, from local curricula which were much more knowledge based (US).

The degree to which the planning was done by the teachers teaching varied. In some schools, teachers planned all units from scratch. At the other extreme units were planned by coordinators across schools and adapted by teachers in each school using commercial programmes to include coverage of subjects like reading, phonics, social studies.

Coordinators and teachers would welcome more models of transdisciplinary units of inquiry and reassurance that there are many acceptable ways to manage them.

Conclusions and recommendations

In this final section of our report we will outline some implications arising from the research in terms of implications for the IBO. It should, of course, be recognised that the project was severely curtailed from its originally planned length and scope and thus our report lacks any evidence about the ways in which the PYP enhancements are impacting schools on a longer term basis. This curtailment, in fact, forms the basis of our final recommendation.

1. In the literature review, we referred to the “enacted curriculum”, which arises from teachers’ interpretation of the intended curriculum as spelt out in official curriculum documents. We distinguished this from the “learned curriculum” which consists of what students really take away from their classroom interactions with teachers and their peers. In the current project, we have been exploring the former of these two. Yet our exploration has been of necessity limited to a study of how teachers at one point early on in a curriculum adoption perceive the curriculum they have been asked to adopt. For a fuller picture of curriculum change in this context, research would need to focus on classroom action (rather than simply perceptions of and plans for classroom action) and also on student activity and perception. We would recommend that IBO should consider commissioning a research project which focuses upon these aspects. This would probably need to focus on a number of case studies, each being rather more in depth, and perhaps longitudinal than those we were able to carry out in the present project.
2. The curriculum change we were asked to explore in the present project is based firmly upon a top-down model of curriculum development, in which the motivation for, and enactment of, the curriculum change originated centrally in the IBO and then was disseminated outwards. This inevitably means that an administrative and managerial perspective dominates the reform. We would recommend that, in future curriculum change projects, more explicit acknowledgement is made of the influence from “the grassroots” which did partially influence the curriculum development.
3. We recognise that inquiry-based learning remains at the heart of the IB philosophy, especially in the PYP. It does need to be recognised, however, that a knowledge-based curriculum, which can be seen as its antithesis, does have a considerable momentum and influence upon the national/state curricula in a range of jurisdictions. IB plans for, and descriptions of, the PYP need to take more account of what might be termed the ‘Hirsch’ perspective. We recommend that some attention is given to this by the PYP team in the sense of being clearer about the place and role of a body of underpinning knowledge in an inquiry-led process.
4. The notion of a transdisciplinary curriculum is central to the PYP but, of course, for teachers to successfully teach in such a curriculum will often demand that they have to operate in ways which are at odds with much of their previous experience and training. It has been found that teachers who experience the teaching of a transdisciplinary curriculum do not change their beliefs about teaching and learning in a consistent, predictable way, often appearing to move towards holding multiple views, some of which are self-contradictory. Exploration of this phenomenon

- would be a useful research project for the IBO, the findings of which would benefit not just the IBO but education more generally.
5. It has been suggested that teachers' professional development in many countries often does not actually meet the needs of teachers. It seems to be the case that effective professional development which promotes changes in teachers' classroom practices can only be achieved by these teachers experimenting on practice, rather than simply being told about new practices. This demands a shift from transmission models (training, cascade) of professional development towards models focusing upon coaching/mentoring and communities of practice. From the findings of the current project it is clear that the implementation of the enhancements to the PYP was supported by the IBO's own training for schools and teachers, including sharing information at PD conferences, specific PD workshops (some online) for PYP coordinators and regular mailings. Aspects of this are classic cascade or training approaches- both top down approaches to professional development, which can, of course, be very cost effective. Teachers in the case study schools appreciated this training, although the delivery mechanism does have limitations. One of the outcomes was a wide variation in the knowledge of teachers between different schools, which planned PD in different ways and offered different opportunities and timescales. This knowledge gradient was an issue in some schools, and our recommendation is that the PYP team needs to a) give some consideration to ways of planning PD using alternative models and b) directly address the training needs of teachers other than PYP coordinators.
 6. The feature of the enhancements most welcomed by questionnaire respondents and case study interviewees was increased flexibility and this was seen as a feature of almost all the enhancements. Most teachers welcomed specific examples of flexibility, for example, in using the planners, flexibility in Early Years provision, flexibility in the length and number of units, greater flexibility in teaching both transdisciplinary units and subject courses, etc. Most were enthusiastic about the perceived freedom offered by the enhancements to the PYP in terms of teaching subjects outside of the programme of inquiry. Sometimes this was seen as legitimizing approaches which had already been taken, such as teaching mathematics outside the units. There were, however, some comments which suggested that some teachers recognised the problematic nature of flexibility in some of these areas. Flexibility inevitably leads to variation and there will undoubtedly be examples where this leads to a dilution of the key philosophical principles underpinning the PYP. Teaching subjects (Science, Mathematics, etc.) outside of transdisciplinary units is an obvious example of this, and was mentioned as such by several respondents in the study. We recommend that the IBO needs to explore this issue carefully with teachers, with a view to formulating some precise guidance on the parameters of such flexibility.
 7. Agency, now positioned at the very heart of the PYP, was frequently the first of the enhancements to be singled out spontaneously by respondents in the case study schools. There was strong support for this emphasis across all the cases backed up by strong support from respondents to the questionnaire. Despite the universal enthusiasm for agency as a central guiding principle, there was also some acknowledgment of the constraints involved, centred on the demands at classroom level of maintaining

purposeful direction while relinquishing some control over the students' learning in the name of authenticity. This can be summed up by this remark from one teacher in a case study school. *"The concept of Agency scares me. I finally understand what Agency is and what it means for our students and staff. However, I feel that it's going to be hard for them (staff and students) to embrace the concept of choice in everything that they do. Meeting state standards and incorporating IB is hard enough, so giving up control and giving students choice is going to be very challenging for some."* We recommend that some further work needs to be done with teachers on the concept and implementation of agency in the classroom. It seems that, by and large, teachers do not need convincing that agency is important, but they do need some support in developing practical strategies for incorporating it fully into their teaching in ways likely to lead to meaningful action.

8. There were a good number of comments expressing concern about the possibility of the Exhibition being reduced in status, not having time to prepare and not reporting the Exhibition. We recommend that the PYP team consider this feedback and either try to dispel the concerns it indicates or work with schools and teachers to clarify the new role of the Exhibition in the PYP.
9. The response to the new electronic resource was varied. The PYP coordinators tended to be enthusiastic about it. However, despite it being one of the features of enhancements to the PYP most welcomed in the survey results, most of the case study school leaders and teachers did not know about it and those who knew about it had not used it independently. Those who had looked at the electronic resource, had done so at the direction of the PYP coordinator who had, sometimes, printed out items from the resource. There seem to be a number of problems associated with this resource. Some schools had access problems which had prevented full engagement so teachers who might have used it had, instead, accessed other open-source materials about the enhancements to the PYP. We recommend that such a potentially valuable resource needs further promotion from the IBO and the PYP team if this potential is to be realised.
10. Schools were experiencing several barriers to change in terms of curriculum development, some of which, such as time for collaboration and discussion, and the support mechanisms within schools, are ubiquitous in most curriculum change projects. One barrier mentioned by many participants in this research, however, lay in the competing demands of local and IB curricula, especially where local curricula were knowledge based, and in the assessment mechanisms and points imposed on school by school groups, states, national bodies or schools themselves. These could shape not only the curriculum but also the year. Of course, these cannot be totally overcome – schools are where they are, geographically and culturally. Nevertheless, it would probably be very helpful for schools to have access to correspondents in the PYP team with whom to talk through these issues.
11. Curriculum change is not a simple, nor a quick, process. Schools and teachers change slowly and in order to capture the efficacy of an attempt at change as extensive as that implied by the enhancements to the PYP, a more long-term study is essential. We would recommend that, if it is feasible, the IBO needs to return to this research in a year or so, when

the world hopefully has returned to a more normal state, to evaluate the longer term effects on schools and curriculum of the changes they have introduced.

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