



MEMORANDUM

Date: April 2, 2018
TO: Superintendent Tom Brymer, Honorable President Laura Wheat and Board of Trustees Members
FROM: Dr. Mechelle Bryson, Executive Director of Westlake Academy
SUBJECT: Policy Analysis and Recommendations Related to Upper PYP Mathematics Instruction Revisited

“The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means, it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth.” These words spoken by Galileo clearly define the significant role mathematics plays in our lives. Four centuries later, Shakuntala Devi, an Indian writer and human computer, concurs, “Without mathematics there’s nothing you can do. Everything around you is mathematics.” The study of mathematics is the process of discovering the patterns of the universe. It is also the study of problems and solutions through an intense understanding of quantity, structure, space and change. Perhaps better phrased through the paradigm of the math of spatial relationships, the late, great Professor Stephen Hawking said, “I attempt to see everything in terms of geometry.”

Background

The question has arisen about the value of ability grouping known as tracking in the upper Primary Years Programme (PYP) mathematics classes at Westlake Academy. Other questions have surfaced regarding acceleration, differentiation and enrichment in the classroom. In response, the Academy’s administrative staff has examined the Academy’s instructional pedagogical philosophy to determine the best practices of mathematics in an International Baccalaureate (IB) World School. This position paper is designed to articulate these practices.

The Academy’s administrative team approached this investigation with an open mind and actively challenged long held beliefs regarding tracking, ability grouping, acceleration, differentiated instruction and the IB transdisciplinary approach to learning. The Academy’s findings are based on the evaluations of peer reviewed research and the IB standards and practices, along with testimonies from educational experts in the field combined with extensive conversations with stakeholders.

Defining Relevant Terms

In an effort to create a common vocabulary that leads to a common understanding, the following terms have been defined:

- **Ability grouping** is “defined as a practice that places students into classrooms or small groups based on an initial assessment of their levels of readiness or ability” (Kulik, 1992).
- **Tracking** is “the practice of assigning students to instructional groups on the basis of ability” (Hallinan, 2010). “The term *tracking* refers to a method used by many secondary schools to group students according to their perceived ability, IQ, or achievement levels. Students are placed in high, middle, or low tracks in an effort to provide them with a level of curriculum and instruction that is appropriate to their needs” (Loveless, 2002).
- **Flexible grouping** is “an instructional strategy where students are grouped together to receive appropriately challenging instruction. True flexible grouping permits students to move in and out of various grouping patterns, depending on the course content. Grouping can be determined by ability, size, and/or interest” (www.nagc.org/index.aspx). It is a fluid and dynamic process. It is not fixed.
- **Differentiation** is “a teaching philosophy based on the premise that teachers should adapt instruction to student differences. Rather than marching students through the curriculum lockstep, teachers should modify their instruction to meet students' varying readiness levels, learning preferences, and interests. Therefore, the teacher proactively plans a variety of ways to 'get it' and express learning” (Tomlinson, 1999). Differentiated instruction is not worksheet driven. It is the process of understanding the differences and similarities of each learner and, in doing so, gathering data that informs the next steps in instruction. Those next steps may vary from student to student.
- **Acceleration** is the “advancement of students in subjects at a rate that places them ahead of where they would be in the regular school curriculum” (Merrotsy, 2008).

It is important to note that ability grouping and tracking are often used interchangeably in the literature review. For the purpose of this paper, these two terms are used synonymously. In contrast, the term flexible grouping is not interchangeable with tracking and ability grouping. It differs fundamentally from tracking and ability grouping in the fluidity of student grouping from one grouping to the next.

Who Are We?

We are an IB World School that offers the continuum of IB programmes. Chartered to provide the IB continuum, the Academy has a fiduciary responsibility to the IB. As such, the Academy is committed to the standards and practices found within the IB framework and to the integration of these standards and practices with the State's curriculum requirements.

Our grandest purpose is to be a college preparatory school. Throughout each programme in the IB continuum, our objective is to prepare students for post-secondary success and

beyond. There is no doubt that our graduates will compete on a global stage and will need specific 21st century skills to be able to successfully navigate an ever-changing internationally minded marketplace. As such, we believe each learner must have equal access to a rigorous college bound curriculum in order to not only meet their potential but to exceed it. As a result, 100% of our students are accepted to college and our students are graduating from college significantly above the national average (see report).

What Is Tracking and Is Tracking a Best Practice?

For clarification purposes, tracking is defined as “the practice of assigning students to instructional groups on the basis of ability” (Hallinan, 1996, 1994). It is basically the practice of sorting and ranking students to determine placement in a track of study. Historically, tracking has been an entrenched practice in American schooling for nearly a century (Futrell & Gomez, 2008). Originally, secondary schools assigned learners to one of three tracks - academic, general, or vocational tracks - designed to prepare students for college or careers. Over time, this practice has been replaced by course levels, such as advanced, honors, regular, or basic courses. “These course levels continue to be referred to as tracks, with the regular and higher-level courses loosely equivalent to the academic track and the basic and lower courses loosely equivalent to the general and vocational tracks” (Hallinan, 1996, 1994).

Tracking was “initially touted as a way of tailoring instruction to the diverse needs of students, tracking has instead become a way to stratify opportunities to learn, limiting the more beneficial opportunities to high-track students and thereby denying these benefits to lower-tracked students. This generally plays out in a discriminatory way, segregating students by race and socio-economic status” (Mathis, 213). In recent years, John Hattie has investigated the variables that have an impact on student achievement and has calculated the numeric effect size of various learning strategies and programs. His work has determined that .40 is the hinge point for effectiveness. Any variable that has an effect size of .40 or better impacts student achievement to a significant degree. In regard to tracking, he found that it has “minimal effects on learning outcomes and profound negative equity effects” (Hattie, 2015, 2009). In fact, his groundbreaking meta-analysis concluded that tracking has a near zero effect size and is a detrimental practice that does not support high expectations for all students. Moreover, the research on heterogeneous (“untracked” or “detracked”) grouping noted a measurable positive correlation with student achievement. It is important to note that Finland has long used heterogeneous grouping as a way to promote high achievement among all its students (Mathis, 2013). The Program for International Student Assessment (PISA) report explained, “In countries where [students] are divided into tracks based on their abilities, overall performance is not enhanced” (Mathis, 2013). Despite the best of intentions, the bottom line is that student achievement is not substantially improved by the practice of tracking.

The Academy acknowledges that the outcome of the literature review is counterintuitive. At face value, tracking should benefit all groups. With that said, the literature review asserts otherwise. The practice of tracking has a low effect size on student achievement based on the following:

- Tracking creates unhealthy competition by creating social stratification (Wheelock, 1992).
- Student placement in tracking pathways is often based on a subjective view of intelligence. In other words, tracking fails to acknowledge true and varied intelligences (Wheelock, 1992).
- Tracking decisions are often partly based upon non-academic criteria such as behavior (Boaler, 2011).
- Tracking increases the achievement gap. Students in lower groupings often receive lower quality instruction (NEA Resolutions B-16, 1998, 2005).
- Tracking leads to student self-labeling that results in decreased expectations from various stakeholders including the student (Wheelock, 1992).
- Tracking is static. Once students enter a track, the student too often remains in that track for the duration of their academic career (Oakes, 2005).

According to recent meta-analysis, tracking fails to improve student achievement due to the curriculum utilized in tracking programs instead of the practice itself (Tieso, 2003). In other words, each track of students necessitates a different approach to the core content to raise student achievement measurably. Too often, the curriculum methodology is the same from one track to the next with only a change in pacing. What is needed is an adjustment to the depth of rigor. It is important to note that increasing the pace at the sacrifice of conceptual or deeper understanding through inquiry is an unacceptable practice.

On the other hand, de-tracking has a clear positive impact on learning. In fact, “de-tracking opens new academic opportunities for students” (Rubin, 2006). This finding is corroborated by recent studies that revealed that learners in heterogeneous settings in mathematics classes outperformed those tracked. “Many parents support ability grouping because they think it is advantageous for high attaining children ... But a recent study of grouping in the US showed that the system benefited students at high and low levels and the high attaining students were the most advantaged by the mixed ability grouping, because they had opportunities to learn work in greater depth” (Boaler, 2007). Consequently, schools that approach learning from a de-tracking perspective are more likely to create cultures of high expectations for all. In fact, studies have found that students in these de-tracked environments took more advanced classes and passed courses at significantly higher rates (Boaler, 2007).

According to the IB, PYP schools should not “practice streaming or setting of students on a continuous basis, for example, gifted classes or continuous pull-out for support” (Broadening the interpretation of PYP Requirement C3.1.b Information Brief 2017). On the other hand, PYP schools should execute transdisciplinary learning. This instructional approach allows schools to group students for short periods of time and regroup them as the content of the learning changes (In Making the PYP Happen Manual, 2009). As a result, students are grouped and regrouped throughout a unit of inquiry to ensure each learner is both supported and challenged.

Within the PYP, teaching and learning are executed through the Units of Inquiry. These Units of Inquiry are designed through a transdisciplinary approach to learning which, according to the IB, dissolves the limitations of traditional educational practices by

embracing a constructivist approach to learning organized within the context of real-world problems or themes (In Making the PYP Happen Manual, 2009). Simply put, the PYP designs learning around six transdisciplinary themes, which are organized through a conceptual lens. Students go beyond single-subject content as enduring conceptual understandings are applied through an inquiry approach.

It is of paramount importance that the Academy aligns its practices with the IB philosophy. It is equally important that the Academy adopts policies, practices and procedures that support and deepen the execution of the IB standards and practices.

Moreover, the IBO has clearly articulated that the IB is a continuum of programmes that do not support tracking. In fact, the IB has written that, “regardless of which teacher leads the unit of inquiry, collaborative planning and subject integration remain requirements, as does the expectation that continuous streaming and setting does not happen in a PYP school” (Broadening the interpretation of PYP Requirement C3.1.b Information Brief 2017). This belief centers around the IB’s commitment to the transdisciplinary approach to teaching and learning and its firm belief that the practice of ability grouping prevents a school’s ability to deliver a transdisciplinary approach to all students or at the very least weakens the delivery thereof.

Core Beliefs about Mathematics

At the heart of the Academy’s instructional pedagogy is a firmly held belief that mathematics is a language. More specifically, it is the language of science. For many students, it feels like a foreign language. As a second, third and even fourth language for our students, math is learned almost entirely at school and is not spoken at home. When you consider the fact that mathematics is the only language shared by all human beings regardless of culture, religion, or gender, it becomes paramount that our students develop proficiency and fluency. This is our goal.

The Academy also believes that learning is an active process. This especially holds true for mathematics and explains why the Academy has shifted the instructional focus from doing math, to understanding math. As a result, our students spend more instructional time engaged in hands-on activities. Although we have placed a greater emphasis on application, we have not abandoned the practice of math skills. We recognize that automaticity with math facts and other mathematical building blocks are fundamental to math efficacy. Moving students from a concrete understanding to an abstract deeper understanding is a cornerstone of our mathematical instruction. We believe that authentic engagement coupled with real-world application is imperative to deepen contextual understanding for our learners.

We believe that flexible grouping, when used appropriately, works. It is important to note that flexible grouping is not tracking. Flexible grouping is the practice of grouping students for guided instruction that changes based on formative assessment data. It is dynamic, not static. It is grouping and regrouping. In other words, groupings vary based upon real time data.

It is also important to note that students in an IB World School cannot matriculate beyond the courses offered in the Diploma Program, DP.

The Academy believes that the “best practice” in the upper PYP math instruction is to utilize flexible groupings within the class to group students based upon readiness in the strand of mathematics under investigation or the PYP transdisciplinary themes. Although this approach is utilized by Westlake Academy teachers with great success through differentiated instructional practices, the Academy acknowledges that all students should be challenged in order to reach their full potential and, better yet, to exceed it. As a result, the Academy utilizes a pull out and push in approach delivered by our Math Specialist to provide additional support and opportunities to students who are achieving at an advanced level within the upper PYP grades.

The PYP Principal, IBPYP Coordinator, Mathematics Specialist and upper PYP teachers work collaboratively to design authentic engagement designed to enrich learning for students who are achieving at advanced levels.

The identification of students will be determined by:

- Ongoing Written Assessments, Classroom Checklists, Mathematics Notebook Writing, and Mathematics Inventories.
- Benchmarks at the Beginning, Middle and End of the Year.
- Data driven dialogue between the math specialist and classroom teachers.
- Students ability to use and connect PYP concepts of form, function, causation, change, connection, perspective, responsibility and reflection.
- Students ability to incorporate ‘Bloom’s Taxonomy and IB MYP Command Terms of Higher Order Thinking

Students selected for pullout and push-in enrichment will have the following attributes:

- Learners who continually use their prior knowledge by confronting and developing their earlier conceptions and constructs of mathematical understanding.
- Learners exploring and re-exploring mathematical concepts for appreciation of ideas that transcend disciplinary boundaries to work towards a deeper conceptual understanding as they approach those concepts from a range of perspectives within the central idea and line of inquiry.
- Learners using concepts to support and structure their inquiries, providing a context in which students can understand and, at the same time, acquire essential knowledge, skills and attitudes in mathematics.
- Learners who construct meaning through higher level thinking and apply their mathematical knowledge to new and unfamiliar situations.

Conclusion

The bottom line is that Westlake Academy is an IB World School that has an obligation to foster and sustain the standards and practices of the IB. It is the Academy’s position that the practice of tracking disrupts a teacher’s ability to deliver a true transdisciplinary

program of study. In addition, it is the belief of the Academy that tracking provides no significant advantages to students and that mixed ability grouping (i.e. flexible grouping) does. The instructional practice of flexible grouping is a best practice that is encouraged at the Academy.

Overall, the instructional rigor found within the IB provides students with a quality education that supersedes that of our traditional counterparts and easily outweighs any relative merits found in the conventional approach of tracking.

Work Cited

- Boaler, J. (2007). University of Sussex. "Grouping Kids By Ability Harms Education, Two Studies Show." ScienceDaily, 21 September 2007.
- Boaler, J., and D. Wiliam. 2001. "Setting, Streaming and Mixed-ability Teaching." In *Becoming a Teacher*, edited by J. Dillon and M. Maguire, 2nd ed., 173–181. Maidenhead: Open University Press.
- Futrell, M. & Gomez, J. (2008). How Tracking Creates a Poverty of Learning. *Educational Leadership*. 65: 74-78.
- Hallinan, Maureen T. (2010). "Tracking: From theory to practice." In Arum, R., I. Beattie & K. Ford (Eds.), *The Structure of Schooling: Readings in the Sociology of Education, 2nd ed.* Reprinted from *Sociology of Education*, 67(2) 79-91, 1994.
- Hallinan, Maureen T. (1996). Track mobility in secondary school. *Social Forces*, 74(3): 983-1002.
- Hattie, J. (2015) *What Doesn't Work in Education: The Politics of Distraction*, Pearson.
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge, 90.
- IBO. (2017). *Broadening the interpretation of PYP Requirement C3.1.b Information Brief*.
- IBO. (2009). *Making It Happen in the PYP*. Peterson House, Malthouse Avenue, Cardiff Gate.
- Kulik J. A. (1992). *An analysis of the research on ability grouping: Historical and contemporary perspectives*. Storrs, CT: National Research Center on the Gifted and Talented.
- Loveless, Tom, (2002). *The Tracking and Ability Grouping Debate*, Thomas Fordham Foundation. NASSP, 2004, *Breakthrough High Schools: You Can Do It Too*, Reston,VA
- Mathis, W. (2013). *Moving Beyond Tracking*. National Education Policy Center at the University of Colorado Boulder.
- Merrotsy, Peter (2008). "Acceleration". In Salkind, Neil J. *Encyclopedia of Educational Psychology*. 1. pp. 4–7. ISBN 1452265836.

Oakes, J. (2005). *Keeping Track: How Schools Structure Inequality* (2nd edition). New Haven, CT: Yale University Press.

Puzio, K., & Colby, G. T. (2010, March). The effects of within class grouping on reading achievement: A meta-analytic synthesis. Paper presented at the annual meeting of the Society for Research on Educational Effectiveness (SREE), Washington, DC.

Rubin, B. (2006). Detracking and heterogeneous grouping. *Theory Into Practice*, 45(1).

Tieso, Carol L. (2003). *Ability Grouping is not just tracking anymore*. *Roeper Review*. 26 (1), 29-36.

Wheelock, A. (1992). *Crossing the tracks: How "untracking" can save America's schools*. New York: The New Press.