

The Differentiated Instruction Approach

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Abstract

Québec schools have a mandate to provide inclusive education that allows all students to reach their individual potential. With the growing diversity in the classroom, teachers need to be equipped with strategies to allow each student to have meaningful learning experiences. Previous research has shown that teachers lack the skills and resources to meet the demands of the classroom. Differentiated Instruction (DI) is a responsive approach to teaching that addresses students' learning profiles, interests, and readiness levels by adapting the content, process, and product. The first section of this project is a review of the literature that breaks down the essential elements of differentiation. The Québec Education Program (QEP) stated that differentiated instruction should be used to attend to the needs of an inclusive classroom. The review summarizes past and present research on this topic. The second section of this project is a series of professional development workshops that outlines the DI approach and provides hands-on strategies to teachers. The workshop series was designed to allow teachers to practice new strategies with guidance from the workshop facilitators. The facilitators of the workshop employ a DI approach throughout the series in order to model DI in action. Teachers are provided a detailed manual of all the strategies covered during the workshops and are given time to collaborate with colleagues.

Keywords: differentiation, differentiated instruction, DI, readiness, interest, learning profile, Understanding by Design, tiered activities, scaffolding,

The Differentiated Instruction Approach

Teachers in Québec are faced with the growing demands of today's classroom. Many preservice and in-service teachers feel ill-equipped to handle the varying academic levels, behavior challenges, and backgrounds found in the classroom. The aim of this project is to educate and prepare teachers to ensure that all students have access to a meaningful curriculum that challenges each of them at their level. Differentiated Instruction (DI) is a research-based approach that allows teachers to achieve this objective. It is a responsive approach to instruction that is tailored toward students' interests, learning profiles, and readiness levels. This enables teachers to adapt content, process, and product all while ensuring that students meet the competencies outlined by the Québec Education Plan (QEP) (Elementary QEP, 2001).

Theoretical Framework

Differentiation is a multifaceted concept with the goal of creating empowered and confident students who will then become successful and functioning members of society. The concept of differentiation has been linked to various theories. Vygotsky's (1978) sociocultural theory supports differentiated instruction as a means to facilitating learning in a diverse classroom. The sociocultural theory validates the importance of social interaction and scaffolding as means to internalize knowledge and make it meaningful in the classroom.

The classroom is now, more than ever, a diverse place. Not only are there a variety of ethnic and language backgrounds, there are several different academic capabilities. It is important for the success of a child that teachers understand the diversity of the classroom and embrace the differences to be able to incorporate them into

learning situations. “Social interaction and cultural activities are necessary in the classroom for proper psychological development” (Powell & Kalina, 2009, p. 246).

Vygotsky (1978) believed that with social interaction all knowledge becomes internalized within an individual and therefore makes learning long lasting.

Sociocultural theory is, therefore, the basis of social constructivism, which fundamentally applies social interaction to learning. The theory behind social constructivism is that learning occurs in conjunction with social interaction (Roehler & Cantlon, 1997). Students are encouraged to take risks and are able to connect prior knowledge to new material. The goal is to have students solve problems with others and then become more independent with time. The teacher guides the students throughout the process but eventually assistance is gradually removed as the knowledge becomes internalized. Therefore the teacher-student relationship becomes more collaborative and reciprocal in nature (Subban, 2006).

A vital part of the successful implementation of social constructivism is communication and dialog. Part of Vygotsky’s theory stated that language is more important than knowledge or thinking. Differentiated instruction emphasizes the need for teachers to understand the demands of their students. In order to develop a sense of their various needs, teachers must talk with the students. The teacher-student relationship needs to be open and communicative. “Dialogue is the catalyst for knowledge acquisition” (Applefield, 2001, p. 48). Communication between peers and adults therefore fosters understanding, especially when using strategies such as, questioning and feedback. Teachers become responsible to make these links between communication and learning through social behavior.

Another key theoretical concept drawn from Vygotsky's research is the zone of proximal development (ZPD), which stated that learning is a developmental process. The ZPD is defined as the "distance between actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 33). The ZPD allows room for the potential of what can be achieved with proper guidance and social interaction. Therefore, students who can solve a problem that they cannot do independently but can with assistance, are working within their zone of proximal development. According to Vygotsky's theory, a student can only move from one developmental stage to the next with support from a knowledgeable adult or peer. This lends itself to the concept that it is important to understand a student's starting point before introducing new material, which is an essential component of differentiated instruction.

Differentiated Instruction and Interest

Differentiated instruction (DI) is a responsive method of teaching that highlights the child and their needs. One of the major goals of DI is for the teacher to become an expert in regard to his or her students, to think of them as individuals rather than a collective whole. One student trait that is important to consider when embarking on differentiated instruction is interest. Teaching should cultivate existing interests as well as provide students with opportunities to develop new ones. An effective DI teacher will be able to foster both existing and developing interests in order to deepen understanding and allow students to be more engaged in their learning (Tomlinson, 2003).

Interest has been a concept studied since the 1800s by Herbart who stated that interest is linked to meaningful learning (Schiefele, 1991). In other words, students whose interests are peaked will apply their learning long-term and be more motivated with future knowledge acquisition. In the early 1900s Dewey, a North American psychologist, found that interest and learning could not be considered without environment (Weber, Martin, & Patterson, 2001). This means that interest can only be fostered when there is an interaction between the individual and the environment. Dewey claimed that, without this reciprocal relationship, learning could only be temporary and thus not meaningful. Learning needs to be considered as both an external source as well as an effort to be successful. Dewey also claimed that interest has three characteristics, it is an active state, it is based on real objects, and has high personal meaning (Schiefele, 1991).

An important assumption stated by Deci and Ryan (1992) in regard to interest and learning is that people enjoy tasks that are of interest to them and that intrinsic motivation is derived from interest (as cited in Tobias, 1994). Therefore, the assumption can be made that a student's lack of motivation can be associated with a lack of interest in the curriculum. This then begs the question of what teachers need to do in the classroom. Mitchell (1993) claimed that teachers can foster motivation by catering their teaching toward student interests. This is in line with the main tenets of differentiation, which encourage the development of learning tasks that incorporate interest.

Interest has been defined as a three-dimensional concept that focuses on meaningfulness, impact, and competence (Weber, Martin, & Patterson, 2001). These three elements are essential in incorporating interest in the classroom as a means to

increase learning and motivation. Meaningfulness refers to the value a task has for a student. The more meaningful the task, the harder the person will work, and vice-versa. “Competence refers to one’s feelings about his or her abilities and prior knowledge” (p. 75). When students feel prepared for a task they are more willing and interested to attempt the task and be successful. Alternatively, if students feel ill-equipped to handle an assignment their anxiety increases while their self-esteem decreases resulting in failed attempts at accomplishing the given task. Last is the impact, which refers to the importance of a task. If a student feels as if there is a purpose behind the assignment more interest will be generated and the more likely that the task will be completed (Tomlinson et al., 2003).

Project Adapt (PA) is a program geared toward at-risk middle-school students (Weber, Martin, & Patterson, 2001). The program pulled students out of the public system and into a school in which they were taught all subject matter by the same teacher, with the goal of receiving more individualized attention. They were placed in magnet schools with the best students in the district and shared recess and lunch with these students in order to foster positive attitudes. Students in the PA programs were involved in activities that were geared toward increasing self-esteem and interest. Students in this program showed an increase in academic performance. The study aimed to examine the affective responses of 46 students in the program with a particular focus on interest. The “PA program is positively related to student affect and interest” (p. 85). Also, positive teacher behaviors such as modeling, immediate reward, positive teacher-student relationship, altruism, teacher responsiveness, and rewards from teachers lead to better affect in students’ responses to interest. Last, different behaviors are associated

with each dimension of interest (meaningfulness, competence, and impact), which supports the finding that interest is a multidimensional concept.

Individual and Situational Interest

The concept of interest is divided into two categories, individual and situational interest. Individual interest or topic interest refers to an interest based on a particular topic or content. Hidi's (1990) review of the literature stated that individual interest focused on the relationship between personal preference and cognitive functioning. The literature has shown that interest has more long-term effects and is correlated to longer-lasting learning. Students whose topic interests are piqued tend to be more successful and more engaged in their learning. Therefore, individual interest is an important variable in predicting effort and motivation during an academic activity.

Although individual interest is beneficial to a student's academic achievement it proves difficult for teachers to foster it in the classroom. Students have many varying interests and teachers feel that the task of individualization is daunting. However, there are different avenues teachers can take to increase the actualization of individual-based interest, such as incorporating interest-based activities in the classroom. Interest-based activities involve several different components such as, attention, involvement, concentration, meaningful, and increased knowledge (Weber, Martin, & Patterson, 2001). Teachers can also conduct interest inventories to determine where interests are targeted in the classroom.

Situational interest is described as an immediate response to an external stimulus that triggers one's focus on a task; this interest may or may not last over time (Rotgans & Schmidt, 2014). This means that interest piques within a learning activity and can be

sparked through various classroom activities. External stimuli that would trigger situational interest are text coherence, vividness, relevance, novelty, unexpectedness, suspense, seductive details, puzzles, computer, and hands-on activities. However, an important element to identify is whether the new information being triggered needs to continuously enter at a steady rate and maintain the same level of interest as when the information was first introduced. Therefore, the information needs to consistently be intriguing and varied, otherwise the student loses interest and in turn motivation.

Another form of situational interest is based on the knowledge-deprivation hypothesis. This hypothesis emphasizes the fact that situational interest can be triggered from the lack of knowledge on a particular topic. It is the result of the gap between what is known and what needs to be learned (Rotgans & Schmidt, 2011). This occurs when a student is introduced to a new topic that piques interest and subsequently the individual wants to increase his or her knowledge acquisition. The problem that the knowledge-deprivation hypothesis encounters is the issues of maintaining interest once the knowledge has been acquired. Rotgans and Schmidt's (2011) study of 69 polytechnic student investigated how situational interest developed in an authentic classroom. Once interest was triggered it diminished but increased again at the end of the learning process.

Rotgans and Schmidt (2014) conducted a study with 60 secondary students that focused on determining the relationship between situational interest and the knowledge-deprivation hypothesis. The study was broken into three separate parts that examined specific aspects of situational interest. Study one's hypothesis suggested that the lack of knowledge is a precondition to situational interest. Participants who lacked prior knowledge were more involved and therefore their situational interest was triggered.

Study two examined what occurred when participants become aware of their lack of knowledge and whether that awareness triggered interest. Students needed be aware that there was a gap in their learning and that they needed to understand the problem in order for their interest to be prompted. Study three researched the question of whether once knowledge is gained does interest decrease. This final study supported the hypothesis that, once interest is triggered and sustained, growing knowledge acquisition leads to decreased interest. Therefore, once a student has gained sufficient knowledge to fill his or her learning gaps their interest level decreases. Teachers need to be aware of differentiating by interest because it may not be sustainable throughout the entire unit. Teachers need to balance the challenge level of their unit and gradually introduce new knowledge so as to continuously spark students' interest, which is consistent with Vygotsky's (1978) zone of proximal development.

Mitchell (1993) built a model of interest based on previous research to test the elements that contribute to situational interest. In order to build this model, Mitchell used both qualitative and quantitative data and then created a survey to test the validity of the model. The model was used with 350 high school mathematics students from three different schools in California. The model was broken down and implemented in three stages. The first stage dealt with the theoretical framework of the model that was based on interest being a multifaceted concept and the ability to trigger as well as hold interest in a classroom. The second stage was developed from the results of focus groups and questionnaires completed by the participants. The qualitative data revealed that interest is dependent on five elements. Puzzles, computers, and group work were three elements that were classified as triggers for interest but did not hold interest long-term. Puzzles

referred to logic puzzles or brainteasers that challenged students and approached mathematics in a different way. Group work sparked social interaction that triggered interest and the ability for students to ask meaningful questions to their peers. Computers also stimulated interest because they offered an alternative route to approach material. Meaningful tasks and involvement were the last two elements of interest that were classified as triggers that are able to maintain or hold interest. Students maintained interest long-term if the task was meaningful and if they were involved in their own learning which supports that interest is a multidimensional concept (Weber, Martin, & Patterson, 2001). Therefore, it is important that students be active learners, which is in line with the DI philosophy. The last stage of the study was a survey to test the validity of the model. Situational interest depended on the five elements, however, future studies should determine to what degree each element effects interest.

Tapola, Veermans, and Niemivirta (2013) investigated the change in students' situational interest based on the characteristics of students as well as the task. Tasks were divided into two categories, either concrete or abstract. Concrete tasks are detailed and are relatable to real world problems, whereas abstract tasks are more general and less detailed. Fifty-two fifth- and sixth-grade science students were exposed to two different computer simulations. The first simulation was a concrete task and the second simulation began as a concrete task and gradually became more abstract during the course of the assignment. The first objective of the study was to determine how situational interest changed as the task changed and how prior knowledge as well as individual interest effected academic achievement. Overall students' interest with both concrete and abstract tasks was high. However, students with concrete tasks maintained interest

whereas students with abstract assignments showed a decrease in interest, which relates to their lack of prior knowledge. Therefore, students with low prior knowledge should be given more detailed tasks to accommodate for gaps in their learning. The students' situational interest did not have a significant effect on academic achievement, however, it is important to note that students participating in the concrete condition had better post-test scores than students exposed to the abstract work. When teachers are differentiating by interest they need to make sure that the tasks are more concrete, especially for low achievers. More complex or abstract tasks should be given to students when they have mastered concrete assignments with minimal support in order to maintain interest throughout activities, which allows students to work and move within their ZPD.

Schraw, Bruning, and Svoboda (1995) examined the relationship between sources of interest, perceived interest, and text recall. Perceived interest is linked to individual interest whereas sources of interest is situational interest. The study identified which external stimuli of situational interest correlated positively to text recall. All six of the factors were related to perceived interest and only four were related to text recall. The participants with higher perceived interest had greater recall. The two factors that had the most significance on impact and recall were ease with comprehension and vividness.

Interests are an important indicator in motivation and therefore are an essential part of differentiated instruction. Teachers can employ interest by using several different types of activities such as independent study, anchor activities, expert groups, Role Audience, Format and Topic (RAFT) based activities, and jigsaws (Tomlinson & Moon, 2013).

Differentiated Instruction and Learning Profile

According to Tomlinson and McTighe (2006), DI is an instructional design model that concentrates on the students who are being taught, the environment in which teaching occurs, as well as how instruction is conducted. Effective teachers consider the point of view of the students, looking at their aptitudes, areas of interest, and learning profile in order to provide meaningful opportunities for students to grow their knowledge, understanding, and skills within the content area (Tomlinson & McTighe, 2006).

Learning profile is the “preferred modes of learning or ways in which students will best process what they need to learn” (Tomlinson & McTighe, 2006, p. 182).

Students differ in many ways, such as their ethnic backgrounds, gender, ability levels, experiences, and learning preferences to name a few (Lovelace, 2005; Tomlinson & McTighe, 2006). Each of these variables impacts the way a student learns. Many different models of learning styles have been put forth. Among these the Dunn and Dunn Learning-Style Model seems to be the most comprehensive and researched (Lovelace, 2005). Learning style refers to the way that an individual attends to, processes, internalizes, and retains new information. Learning styles allow individuals to maximize the extent of their learning.

The concept of learning styles is not new to the field of education. The work of Dunn and Dunn in the area of learning styles has been published since the late 1970s. However, the debate still continues, regarding the effectiveness of models that emphasize learning-style or modality-based instruction (Landrum & McDuffie, 2010). Landrum and McDuffie (2010) cautioned teachers about the use of learning-style based instruction because their review of the literature suggested a lack of evidence from empirical studies on the effectiveness of learning-style or modality-based instruction. However, the work

does acknowledge the importance of providing differentiated instruction based on the students' learning profile, which includes their learning style.

Lovelace's (2005) meta-analysis built on the work of Dunn and Dunn, evaluating the effectiveness of the learning-style model for instruction. The Dunn and Dunn model incorporated 20 or 21 elements (depending on the age of individual) that make up an individual's learning style. These elements are divided into five categories:

“environment, emotionality, sociological preferences, physiological preferences, cognitive processing inclinations” (Dunn et al., 2009, p. 136). According to Dunn et al. (2009) and Lovelace (2005) once a student's learning preference has been identified a teacher can incorporate that within their approach to instruction, considering the methods to be used and the sequence that will allow students to optimize learning. Lovelace's (2005) revealed that this effective and responsive approach to teaching led to improved student achievement. According to Marzano, Pickering, and Pollock (2001) learning-style instruction can increase achievement by 25 to 30 percentile points (as cited in Lovelace, 2005). Also learning-style instruction can improve students' attitudes towards learning. Lovelace's (2005) study yielded similar findings that support the idea that learning-style and responsive instruction can have a positive impact on student achievement and attitude towards learning.

Teachers' beliefs about students' capabilities have a great impact on their approach within the classroom. Rosenfeld and Rosenfeld (2008) looked at the effects of professional development for teachers that make them aware of individual learning variances. In this study, teachers were placed in either a 28-hour or 56-hour professional development program. During their sessions teachers learned about their learning

differences as compared to their colleagues. Following their professional development, a significant change occurred in teacher beliefs. Teachers' beliefs were determined through pre- and post-tests using an open-ended question for which each teacher provided a written response. The question asked teachers to explain their individual definition of a weak student. An increased number of teachers assumed that student achievement could improve through their instruction and intervention. Once teachers developed an understanding about the different learning styles that could be present in their classroom, they were able to develop more effective beliefs about their students. The teachers began to intervene more as they gained knowledge and understanding of how to identify and address individual learning differences. This led to more student success within the classroom and provided the teachers with increased feedback on the efficacy of their instruction. The professional development and classroom application allowed most teachers to see student learning on a continuum. Students, who were previously seen as weak and fixed, could now be taught and move along the continuum of learning. Student ability was no longer perceived as fixed. Teachers were able to see that their instruction and intervention could effect change in student learning and success (Rosenfeld & Rosenfeld, 2008). The study emphasized the importance of professional development in the area of learning preferences in order to change teacher beliefs and effect change in the classroom.

Many teachers address the needs of struggling learners, but few address the needs of gifted students who are underachieving. Rayneri, Gerber, and Wiley (2003) looked at the impact of learning style preferences on gifted students. The students' preferences were determined through self-report surveys. The study examined some of the

differences between underachieving and achieving gifted students. Gifted students identified themselves as global, right-brain learners. Although 80% of the achievers reported preferences towards tactile learning experiences, all of the underachievers specified this preference. The low-achieving students' responses demonstrated their need for tactile, visual, and kinesthetic modes to engage in learning opportunities. The low-achieving students also preferred more structure, demonstrating that they required frequent check-ins with their teachers and shorter deadlines for assignments. Frequent feedback is essential for these learners, because they reported low motivation and persistence (Rayneri, Gerber, & Wiley, 2003).

The research on learning styles (Dunn et al., 2009; Landrum & McDuffie, 2010; Lovelace 2005; Rayneri, Gerber, & Wiley, 2003; Rosenfeld & Rosenfeld, 2008) revealed the importance of the identification of each student's learning preference in order for teachers to accommodate the varied learning differences within their classroom.

Learning style should not be the sole method or approach to teaching and instruction. Tomlinson (2003) suggested that learning-style instruction should not override the importance of differentiating instruction by readiness levels. Learning-style instruction should be seen as complementary to other approaches to differentiating instruction.

Differentiated Instruction and Readiness

Along with valuing interest and learning profile as essential components of DI it is important to understand students' strengths as well as their weaknesses. Understanding where a child is coming from, his or her prior knowledge, and learning capabilities, is referred to as readiness. Readiness can simply be explained as how ready students are for

the content to which they will be exposed. It is not their ability or capacity to learn but their “proximity to specified learning goals” (Tomlinson & Moon, 2013, p. 10). In a classroom, there are several readiness levels; there are those who are working at grade level, those who working below grade level and the students who perform beyond grade level expectations. It is one of greatest challenges faced by teachers because readiness levels can vary within different contexts. Readiness levels “can be conducted through achievement tests, performance assessments, oral presentations, writing assignments, and student portfolios” (Lyons, McIntosh, & Kysilka, 2003, as cited in Pham, 2012, p. 16).

Understanding a student’s readiness level is derived from Vygotsky’s (1978) zone of proximal development. A teacher can only determine a child’s readiness level by understanding his or her ZPD. Rather than thinking of success as what a student can do, it is important to understand what a student needs to be successful (Tomlinson & Moon, 2013). Effective teachers need to be able to navigate their students’ readiness levels and provide the right material to target their varying abilities.

Students benefit from differentiation by readiness because it is targeted toward their learning goals. Csikzentmihalyi, Rathunde, and Whalen (1993) reported in a qualitative study of adolescent schooling that when students’ academic assignments did not match their cognitive ability the effects were detrimental (as cited in Tomlinson et al., 2003). If a task is too difficult, the students become withdrawn and their self-esteem is affected.

Another study that exposed the benefits of differentiating by readiness is a meta-analysis conducted by Lou et al. (1996). Their meta-analysis quantitatively combined two sets of findings that questioned the efficacy of within-class grouping. Within-class

grouping can be defined as a classroom broken down into smaller learning groups based on ability. This meta-analysis showed there were small but significant effects by placing children in ability groups. Lower-ability students benefited most from heterogeneous groupings in which they had support from their peers and therefore encouraged social interaction. Average-ability students benefited most from homogeneous groups. “On average students placed in small groups achieved more, held more positive attitudes and reported higher general self-concept than students in non-grouped classes” (p. 446). In order for small-group instruction to be effective there needed to be adapted instructional materials and strategies, which is consistent with a DI approach.

Pre-assessment and Readiness

In order for teachers to provide specific learning tasks that correlate to targeted learning goals it is first essential to assess a student’s baseline of prior knowledge. Assessment is typically administered at the end of a teaching unit as a way to determine a student’s mastery level. However, with differentiated instruction constant assessment is an excellent indicator of readiness. In order for DI to be effective, teachers should administer both pre-assessments and ongoing assessments that are both formative as well as summative.

Pre-assessments done in regard to readiness are dual-faceted. The first purpose is to identify a student’s misconceptions and the gaps in their learning in relation to their ZPD (Tomlinson & Moon, 2013). This eliminates any assumptions a teacher may make about what a student already understands. It is vitally important that teachers catch any prior learning misconceptions, such as “incorrect prior instruction, the student’s past

experiences or forgetting” (p. 30). Reversing these misconceptions needs to be done before adding new content to the learning schema.

The second purpose of the pre-assessments is to determine a student’s level of mastery of the skills needed for the unit being covered. Tomlinson (2003) stated that it is important not to waste valuable teaching time teaching concepts that have already been mastered. Students will not be engaged in lessons when the content is repetitive and adds no significant skills to their learning.

In order for a pre-assessment to be successful it should fall within the following five constraints (Tomlinson & Moon, 2013). The first constraint is that the assessment should target any necessary information that is relevant to the unit, which is referred to as KUDs. The K should therefore test students’ knowledge such as the critical vocabulary needed for the unit. The U refers to the understanding of the significance of a unit. The pre-assessment should therefore be targeted toward understanding how the concept works. Finally, the D is for “do”, which refers to the skills a student will need to be successful in the unit. The second constraint is that the method of data collection is appropriate and corresponds with the needs of the teacher and the goals of the unit. The third constraint is that the pre-assessment recognizes issues of time; it should be short and only take a few minutes. The fourth constraint is that the pre-assessment should be ordered in a way that allows teachers to quickly determine where students are in relation to the KUD. The assessment should easily determine the needs of the students rather than having to compile data to determine area of difficulties. The last constraint, the pre-assessment should only be used for gathering data and not for grading or instruction. It would be unfair to use a pre-assessment for grading because the students have not yet

been exposed to the core instruction and therefore it would not be a true reflection of their abilities.

There are various methods to incorporate pre-assessments into the classroom, which fit the five constraints and are time-efficient for teachers. One method that has proven to be effective in schools is Response to Intervention (RTI). RTI is a three-tiered model that helps teachers to identify specific difficulty areas that a child is experiencing. The first tier is simply universal whole-group instruction in which students will acquire the necessary skills, as well as understand and apply those skills to other learning tasks (Seedorf, 2014). The second tier involves benchmarking and ongoing assessments that determine the specific learning difficulty of an individual. Once those difficulties have been identified, a target intervention is implemented. Throughout the course of this intervention, teachers administer short ongoing assessments to gauge the efficacy of the intervention. The last tier is for students who did not benefit from the intervention and require special services and more intensive intervention (Pullen, Tuckwiller, Konold, Maynard, & Coyne, 2010). However, students in tier 3 still receive benchmarks and ongoing assessments.

Pullen et al. (2010) investigated the effect of RTI on 224 first-grade students in regard to vocabulary intervention. Tier 1 exposed the whole class to wide range of vocabulary. Reading instruction activities and ongoing assessments were done to establish which students needed more individualized intervention. Tier 2 provided more direct and targeted intervention for at-risk students and provided them with additional chances to process new vocabulary. At-risk students showed significant gains after exposure to tier 2 intervention. This supports the idea that the RTI model is a useful tool

in the classroom for pre-assessments to determine difficulty areas and judge the effectiveness of the intervention in place.

Scaffolding and readiness. To be successful with differentiated instruction it is important to be able to guide students through their zone of proximal development. Teachers need to produce material and lessons that will be just above the student's ZPD (Subban, 2006). For students to move through these zones teachers need to use scaffolding strategies. "Scaffolding instruction may best be understood as a sequence of prompted content, materials, and teacher or peer support to facilitate learning" (Bender, 2002, p. 54).

Lutz, Guthrie, and Davis (2006) examined reading comprehension in grade four and the impact of scaffolding in a reading-science integrated instruction as compared to a traditional classroom. Three classes were used; classes one and two received the integrated instruction while the third class received regular reading comprehension instruction. Overall, students in classes one and two showed strong growth in reading as compared to class three. Students in classes one and two were initially provided with a high level of scaffolding. Scaffolding was gradually reduced once students were able to handle the demands of the assignment with limited support. These students showed more engagement with complex tasks when provided varying levels of scaffolding. Alternatively, students in class three needed consistent moderate levels of scaffolding to complete basic tasks. Students in classes with a high number of scaffolds performed better with reading comprehension and demonstrated more engaged behaviors. Last, lower achieving students need more instruction beyond the scaffold to maintain engagement throughout the task.

Simons and Klein (2007) separated scaffolding into two categories: hard and soft. Soft scaffolding refers to scaffolding that happens during instruction, giving feedback, and questioning students. Hard scaffolds are created before a lesson and will guide students through specific areas of the assignment, particularly with parts that are more difficult. The study investigated the role of hard scaffolds in a problem-based learning situation. One hundred eleven 7th-grade students were put into three classrooms with varying levels of scaffolding to examine the effects within a problem-based learning environment. Two classrooms were required to have scaffolds, two classrooms were given the option to choose scaffolds, and one class had no scaffolds. Students were required to finish two components of a group project. Students who were part of the optional and required scaffolds did significantly better on one component of the group project than students with no scaffolds. Although students performed better on one part of the project the overall performance was low due to lack of feedback and expert guidance throughout the problem-solving process. When differentiating, teachers need to make sure that scaffolded tasks are attainable for all students. However, teachers cannot solely rely on scaffolds; their feedback and questioning are essential to the learning process. Scaffolds provide students with the chance to work at their own level with minimal support.

Scaffolding strategies and readiness. There are several techniques that will enable teachers to be successful in coaching their students to move throughout the zones.

Modeling is one strategy in which teachers can demonstrate how to solve a concept while students replicate the teacher's actions (Bliss, Askew, & Macrae, 2006). The teacher serves as a role model and demonstrates how to use specific skills and to

think critically. Students observe as their teachers carry out the necessary skills to solve a problem and then attempt the task independently or with support. It also allows for some teacher-student interaction, which is supported by Vygotsky's (1978) social learning theory that suggests that social interaction is essential to learning.

Feedback is another strategy that helps students transition through the zones. Feedback needs to be compared to a standard of what is expected (Sanders & Welk, 2005). It allows students to compare their work to the standard and understand their mistakes in order to learn. Feedback needs to be specific; teachers need to provide specific instruction to steer their learning in the right direction. Teachers should allow for discussion between themselves and the student in order to develop a solution to create a better work product.

Instructing is when a teacher is in the driver's seat; the teacher is in control and directs the path to learning. Instruction is vital to learning because it provides students with foundational knowledge and skills for critical thinking. Instruction should be internalized and then slowly be converted into metacognitive strategies that students will apply to future tasks (Bliss, Askew, & Macrae, 2006).

The fourth type of scaffolding is questioning. This strategy is used for clarifying student understanding (Roehler & Cantlon, 1997). It provides opportunities for students to make adjustments to their comprehension if their knowledge base was not in line with the specific skills needed to be successful in a given task. Sanders and Welk (2005) distinguished between two types of questioning, questioning that assists and the alternative that assesses. One type of questioning is used to clarify concepts for students whereas the other assesses a student's level of understanding.

That last type of scaffolding is cognitive structuring. This is how students organize information to use in future thinking (Bliss, Askew, & Macrae, 2006). It is the most difficult type of strategy to implement because it involves helping a student to organize their knowledge. This provides students with strategies to apply their newly acquired skills to other tasks.

Readiness and tiered activities. “Tiered assignments are differentiated learning tasks and projects that you develop based on your diagnosis of students needs” (Heacox, 2002, p. 91). Tiered tasks can be assigned based on interest, learning profile, and readiness. These tasks allow students several different avenues to approach learning by targeting their specific needs. In order for teachers to create effective tiered assignments they should have a good understanding of their students’ ability, which are usually obtained through pre-assessments or interest surveys.

The premise of tiered assignments is to provide students with different tasks that fit their developmental abilities. These tasks can be done individually, with teacher assistance, or in a collaborative group. According to McMackin and Witherell (2005), there are no set numbers of tiers; the number of tiers depends on the varying abilities in classroom. The number of tiers is left to the teacher’s discretion depending on the needs of the classroom. Tiered assignments are intended to help teachers to work through their students’ ZPD levels. Tiered activities allow teachers to provide students with challenges that are within range of their cognitive development (Dixon-Krauss, 1996).

There are many ways that a teacher can implement tiered assignments in the classroom. Heacox (2002) stated that teachers can tier lessons in several ways one of which is by challenge level using Bloom’s taxonomy. Bloom’s taxonomy is a continuum

of thinking levels that increase in difficulty (Anderson, Krathwohl, et al., 2001).

Struggling students are more likely to participate in tiered assignments that are targeted to the least complex levels of Bloom's taxonomy; knowledge and comprehension.

Knowledge involves recall of information and understanding refers to when students apply their knowledge by retelling, explaining, or summarizing. Students who have demonstrated basic understanding of the material will be asked to complete tiered assignments that are targeted towards the application and analysis level of Bloom's taxonomy; these activities include critical thinking such as compare/contrast and critiquing (Gregory & Chapman, 2007). Students who have shown a mastery of the content will complete assignments that have a focus on the evaluation and synthesis levels. During evaluation tasks, students learn to judge, predict, and justify their learning. When synthesizing, students are asked to hypothesize, design, and create in relation to the task.

Pierce and Adams (2004) used a mathematics lesson that was created under a Javits Grant and federally funded in collaboration with Indianapolis Public Schools and Ball State University in Indiana to outline eight steps in creating effective tiered assignments. First, it is important to determine the grade level as well as the subject area that will be targeted. McMackin and Witherell (2005) emphasized the importance of having a clear objective for the concept being covered and the desired outcomes of lesson while maintaining these goals throughout the unit. However, students will be at varying points of comprehension, therefore, tiers should be appropriately challenging for every learner. "It is the increasing cognitive demand placed on the learner that should differentiate one level from the next not the amount of physical work involved"

(McMackin & Witherell, 2005, p. 244). Second, an efficient tiered unit must be aligned with the standards in the Québec Educational Plan (QEP) (Elementary QEP, 2001).

Next, it is important to know the goal of the unit and what skills the student is expected to gain after the unit. “If you don’t know where you are going, how will you know how to get there” (Pierce & Adams, 2004, p. 61). Therefore, it is better to start with understanding the end result of the unit than working toward an unknown endpoint. The fourth step in forming a tiered unit, is to understand the background of the students and what skills need to be introduced or reviewed before the commencement of the unit.

Following pre-assessments, a teacher must consider what to tier; content, process, or product (Pierce & Adams, 2004). After this it would be essential to determine if the unit should be tiered by readiness, interest, or learning profile. Once the type of tiering is decided, it is time to decide the number of tiers needed. Last the type of assessment needs to be determined, it can either be formative or summative. The assessment must be in line with the targeted skills students were expected to achieve and based on their specific needs as well as abilities.

Ultimately, the idea behind tiered activities is for students to be working at a level that corresponds to their needs. If an activity is within their developmental level students will be able to work independently with little guidance. Teachers will then be able to evaluate and guide students to be challenged and slowly move up through the hierarchy of thinking levels as outlined by Bloom’s taxonomy.

Differentiating by Content, Process, and Product

Teachers work through the zones of proximal development by modifying the content, the process, and product of their teaching unit to fit the needs and the various

learning levels (Gallagher, 1975; Renzulli 1977, as cited in Maker, 1982). Content refers to the materials being used to teach a unit. “The content should be challenging but manageable, otherwise students fall behind and get discouraged” (Pham, 2012, p. 16).

Modifying content will be successful if it is in line with the student’s cognitive development. Teachers can modify content by changing the way a student is introduced to the unit either with the use of graphic organizers, visual aids, auditory aids, and manipulatives (Tomlinson, 2003). Sometimes teachers may have to change the content completely with students who have severe learning disabilities. It would be futile to expect a child to engage in a concept for which they are lacking the cognitive ability or prior knowledge skills.

The process refers to activities that help students make sense of what they are learning (Pierce & Adams, 2004). It is the procedure of determining if students are able to apply the knowledge they are learning to different situations. The process is the part of learning that indicates if a student truly understands and can make sense of the skills and knowledge they have acquired. An example of this would be any task that occurs during the school day. Classroom work is when a teacher gains an indication of whether a student is able to dissect the newly acquired information and apply it to other problems.

Last, the product refers to the outcome of the unit (Pierce & Adams, 2014) essentially it is the assessment part of the learning process. This is the time that students are able to demonstrate their knowledge acquisition and their level of understanding. Unlike process, product assesses learning at the end of a unit, rather than after a day or two of learning (Tomlinson, 2003). It is the opportunity for teachers to gauge how

students have extended their learning. Product does not only have to come in the form of tests; it can be projects, authentic assessments, problem based inquiries, or portfolios.

Differentiated Instruction and Learning Environment

Facilitating a differentiated classroom can be a complex process. Maintaining strong classroom management and a positive learning environment is a requirement when implementing differentiated instruction. Teachers often struggle with the concept of DI because of its potential effect on classroom management and their ability to maintain control. It requires detailed planning and organization to be successful.

The first step in creating a healthy classroom environment is to follow the main tenets of differentiated instruction, which begin with getting to know the students. As discussed in the readiness section, pre-assessments are a good way to understand the individual needs of each student but it is equally important to build a positive rapport with the class. “Until that human feels safe, until that human feels a sense of belonging, energies cannot go to learning” (Tomlinson, 2003, p. 15). At the beginning of the year, teachers should take the time to build positive relationship with their students.

Tomlinson (1999) explained that a healthy classroom environment is dependent on the relationship between student and teacher. This relationship is explained as an equilateral triangle with the teacher, student, and content at each vertex. Each point of the triangle needs equal attention in order to manifest effective teaching that supports the whole child. The top of the triangle is the teacher who should be an effective leader who feels secure. A secure teacher thinks of oneself as a learner and is comfortable with not having all the answers. A secure teacher is aware that the climate of the classroom is dependent on the attitude that the teacher brings into the classroom. “A key ingredient in

the learning environment is the mood of the classroom” (Tomlinson, 2003, p. 5). Students in a healthy classroom feel equal to their peers, have power over their learning, and feel acceptance in the environment. Last the content needs to be meaningful, relevant, and authentic to the lives of each student.

A classroom in which students are involved in their own learning provides students with more opportunity to become self-determined rather than having an over reliance on the teacher’s guidance. Young (2005) stated that classroom environments that engage students and seek to develop more meaningful learning foster more self-regulated learning. Students who were taught in a more controlling environment were not as independent and did not use effective strategies in their learning process. The study was conducted with 257 participants who were in the process of completing their undergraduate degrees. The study measured the effect of classroom environment on motivation and autonomy. Personal interaction, feedback, and clear expectations increased intrinsic motivation and the use of self-regulated strategies.

Students benefit from a classroom in which they can receive affirmation, support, and a challenge. The space in classroom should be safe; students should feel free to make mistakes and, more importantly, learn from their mistakes. De Anda (2007) stated that teachers need to be willing to give up the authoritarian role in order to build significant relationships that foster open discussion. Teachers need to create an atmosphere in which students feel the freedom to share and question without being judged by the teacher or their peers. Teachers can do this by sharing personal anecdotes, positive energy, and humor (Tomlinson, 1999).

By the same token, the classroom needs to be a place where students feel challenged and feel they are able to achieve their goals. Teachers need to continue to challenge and have high expectations of their students (Tomlinson et al., 2003). It is essential to balance the ability to teach to the needs of a student but also continuously encourage students to strive for more while working in their ZPD.

Effectiveness of a Positive Learning Environment

Santangelo and Tomlinson (2012) stated that an effective learning environment is one that consists of routines, procedures, has the physical setup of the classroom that supports DI, and is flexible. A healthy environment is one in which there is certain amount of flexibility with content, space, and time. The physical setup of the classroom is also an essential element in creating a healthy learning environment. Students' responses to their environment stems from their biological makeup (Dunn, Thies, & Honigsfeld, 2001). Therefore, it can be implied that students who are not comfortable in their learning space will not be as successful as students whose physical needs are being met. A traditional classroom may in fact be detrimental to learning outcomes (Burke & Burke-Samide, 2004). Factors such as proper lighting, noise, and temperature are elements that effect the environment and should be considered when any teacher is setting up the classroom. These factors are consistent with a student's ability to learn and internalize knowledge, and are in line with the Dunn and Dunn Learning-Style Model (Dunn et al., 2009).

Tricario and Yendel-Hoppey (2012) conducted a qualitative study that sought to understand what were the key elements in facilitating a differentiated classroom. The participants in the study were three apprentice teachers who were under supervision of a

mentor. A lack of consistent classroom management can gravely diminish the effectiveness of differentiated instruction. Classroom management in this study referred to the ability to effectively manage behavior using a consistent management system, establishing a rapport with students, and creating guidelines for movement around the classroom during interactive activities. One of the three teachers in the study struggled with behavior and therefore was unable to dedicate as much time to individual student learning. The mentor in this case had to consistently intervene with behavior, which meant that valuable time was dedicated to regulating behavior rather than differentiation.

Patterson, Connolly, and Ritter (2009) described the process of restructuring an inclusion classroom to facilitate and manage differentiated instruction. The restructuring occurred in an inclusion class of 18 students with diverse backgrounds, with 89 % of the students having Individual Education Plans (IEP). The classroom had two teachers, one who did the core teaching and the other who circulated and kept students on track. Teaching in this class was more teacher-centred with a lot of time dedicated to lecturing. The students in the class were not motivated and teachers noted that they were not meeting the needs of all their students. The teachers decided that it was not inclusion that did not work but their methods of teaching. In order to properly manage a differentiated classroom the teachers decided to break the classroom into groups that would foster social interaction. Each student in a group was assigned a specific role, so as to avoid wasted time or ambiguity during the learning process. Each group had a leader, who made sure other group members were on task. The messenger was the go-between the teacher and the group. There was one distributor and collector who were in charge of managing the materials needed for the tasks and last there was an encourager who served

as the group cheerleader. The teachers then created a four-part instructional model that allowed students to move with their groups to various stations. During these stations students would learn new material, remediate skills, review new instruction, and finally have a computer-based system for review, and exposure to upcoming material. Seventy-eight percent of the students had made academic gains after DI was implemented. The new environment, routines, and rules were beneficial to each student and supported different learning levels.

Classroom organization. Heacox (2002) provided teachers with several tips to maintain a functioning classroom while implementing and facilitating differentiated instruction. It is important to be organized and plan ahead of time. Teachers should separate materials according to levels in bins and prepare group assignments ahead of time and designate a place for students to put their work after each activity. The ideal setup for a classroom would be for students to work in groups thus limiting the amount of movement. A pattern for movement should be established for students in order for transitions to go smoothly. Students should have a clear set of expectations for the assignment, behavior, and noise level. Teachers should also set aside particular times to meet with each student to provide one-on-one instruction. Rules should be predetermined so that students are aware of appropriate times to approach the teacher for assistance thus limiting disruption during individual instruction. These tips will help eliminate the chaos that could possibly ensue with a differentiated classroom.

Understanding the Brain

Learning is a natural process of the brain. In a DI approach, teachers are facilitators of learning. It is therefore vital for teachers to understand the ways in which

the brain processes and stores information. “The truth is that the brain naturally learns what it needs to if there is useful information, if the information is interesting, and if the challenge is appropriate” (Gregory, 2005, p. 5). This statement by Gregory is in line with the principles of differentiated instruction that were established by Tomlinson (2003) who encouraged a responsive teaching approach that addresses children’s interests, learning profiles, and readiness levels.

In her book, Gregory (2005) explored some the brain research that has taken place over the last 50 years. Many different theories about the learning process have been put forth. These theories have helped to advance our understanding of how the brain processes and eventually stores information. Restak (1994) identified five learning systems that influence how individuals intake and interpret information (as cited in Gregory, 2005). “The five systems are the emotional learning system, the social learning system, the physical learning system, the cognitive learning system, and the reflective learning system” (as cited in Gregory, 2005, p. 6). For the purposes of this paper, focus will be placed on the emotional learning system. This system is mediated by emotions. Students will look for safety and comfort within the classroom before they can even think about attending to learning. It important that teachers create a classroom climate that allows students to feel valued, cared for, and capable. It is critical for teachers to consider the emotional needs of their students as they directly impact a student’s ability to learn.

Children’s brains create connections among neurons at a rapid rate, much faster than the adult brain. Over time, usually around puberty, the rate at which connections are made slows (Sousa, 2006). At this stage the brain begins to solidify the connections that

the brain deemed useful. This is mediated through an individual's experiences. The brain also begins to remove the connections that were not helpful or beneficial. According to Sousa, this has been found to be most powerful during the formative years. This has an important implication for early childhood and elementary school teachers. The years spent in preschool and elementary school are vital to a child's development. It is important teachers recognize the crucial role they play as facilitators of learning. Throughout childhood the brain is developing, each experience making its contribution.

The Information-Processing Model

Sousa (2006) created the Information-Processing Model to help teachers understand how the brain processes and stores information. This model was derived from previous work by Stahl (1985, as cited in Sousa, 2006) on cognitive processing. Understanding how the brain both processes and stores information is important for teachers in the planning and execution of the lesson plans, allowing more students to better understand and remember what was taught. Sousa outlined a few limitations to the model. The model is linear while the brain is a parallel processor. It did not address the biochemical changes that occur. The processes are described as mechanical when in fact learning as a process is both biological and complex. Each of these limitations was intentional. Sousa created a simple and clear model to explain the important processes that teachers need to understand about how the brain learns. Sousa also cautioned teachers about following the Computer Model. He stated that the brain is complex, learning is mediated by our emotions. As human beings we use judgment and creativity. The human brain also works at a slower pace than the computer, and has less readily available space to hold information while working on a task.

According to Sousa's (2006) model, all information enters the brain via the senses. The brain's primary role is ensuring survival. Sight, hearing, and touch contribute the most to learning. The sensory register screens the information before it is sent to the brain. It acts as a filter only allowing the important information to be sent. The information is screened for information that is pertinent to survival and previous experiences. The information is then sent to the immediate memory. The information is held there for a short period of time, less than a minute before being removed or stored. The immediate memory operates both consciously and subconsciously. The individual's previous experiences dictate the importance or relevance of information. Once information is deemed to be unimportant, it is discarded. Discarded information is not stored, and therefore it can never be remembered. Input processing is mediated by priority. When something is deemed to be vital, especially to an individual's survival, it becomes a high priority, and given more attention in order to take the necessary action or actions.

The brain responds to perceived threats (Sousa, 2006). When a threat is perceived it is processed immediately and shutting down all other processes to attend to the threatening stimuli. Threats and emotional stimuli are given high priority. Similarly to threats, emotional responses can take over rational thought processes. Emotions, both positive and negative, can strengthen memories. This has direct implications for the classroom environment. Children need to feel safe both physically and psychologically in order to attend to learning situations. Understanding emotions is an important part of development and crucial for learning. By understanding their emotions and emotional regulation repertoire, children can utilize these understandings to become more

productive students and to achieve more success. Emotions can enhance or hinder learning. This is consistent with Restak's emotional learning system (as cited by Gregory, 2005).

Information processing and working memory. There are different types of memory (Sousa, 2006). One of the most important to understand is the working memory. Working memory is used for conscious processing, acting as temporary storage. This is where individuals can build on, break down, and reformulate concepts. The information held in working memory is sent by the sensory register, immediate memory, or long-term memory. The capacity of the working memory increases during childhood. Miller (1956) found that working memory can only hold a limited number of items (as cited in Sousa, 2006). Table 1 shows the range of items that can be held in working memory from birth to adulthood (adapted from Table 2.1, Sousa, 2006, p. 46). The working memory can house on average seven items. Understanding the limits of working memory has great implications for the classroom. Teachers should consider the number of items they are expecting children to hold in their working memory. Teachers who ensure that they do not expect students to exceed their working memory capacity will increase the likelihood that their students will retain the information. Teachers can also increase functional working memory capacity through chunking. This is consistent with Miller (1956, as cited in Frey & Fisher, 2010) who explained that students can hold approximately seven items at a time and therefore instruction should be provided in chunks, optimizing both working memory and transfer. It is important for teachers to understand that working memory only holds information for a short period of time. This can be enhanced when students are highly motivated by the topic. This is consistent with

Gregory (2005) who stated that the brain processes and stores information that is deemed to be interesting, pertinent, and challenging. The DI approach laid out by Tomlinson supports providing instruction that is appropriate for each student's readiness levels, learning styles, and interest. The DI approach supports the implications for learning outlined in the Information-Processing Model.

Table 1

Changes in Capacity of Working Memory with Age*

Approximate Age Range in Years	Capacity of Working Memory in Number of Chunks		
	Minimum	Maximum	Average
Younger than 5	1	3	2
Between 5 and 14	3	7	5
14 and over	5	9	7

*Note: Table 1 is adapted from Sousa (2006), Table 2.1, p. 46

Working memory is temporary storage and its capacity is limited by the number of items and for the amount of time information can be stored. The time limits for working memory have been investigated since the 1880s by Ebbinghaus (as cited in Sousa, 2006). Ebbinghaus explored the amount of time an individual could work on a given concept or task before reaching mental exhaustion, finding that 45 minutes was the average time limit for working memory, which at the time was referred to as short-term memory.

In 1979, Russell explained that time limits are age-dependent (as cited in Sousa, 2006). He stated that most pre-adolescents can process information attentively for approximately five to ten minutes. After five or ten minutes, the student is likely to be

mentally tired or bored. For attention and focus to be maintained, the information needs to be changed or manipulated. It may need to be worked on in a different way or from a different perspective. By playing with how the students are working with the information it can alleviate or reduce boredom and fatigue. If boredom or fatigue set in and there is no alteration made, the information will usually be dropped from working memory.

Adolescents and adults have a slightly larger time limit for working memory. They can process information for about 10 to 20 minutes. These time limits, as with all learning processes, can be influenced by emotions.

When an individual is highly motivated or interested in a particular concept, the capacity to process information can increase, allowing the individual to attend for hours. Emotions can also impede learning. If an individual is experiencing difficulties that require a resolution and that are weighing on them the items may be held there for hours or days. This may impede the individual's ability to hold other information pertinent for learning in working memory. Russell's work (1979, as cited in Sousa, 2006) work has great implications for the classroom. The time limits suggest that teachers should be conducting more frequent, shorter lessons to allow for long-term storage of information. Lessons of 15 to 20 minutes should be used in favor of a 40-minute lesson plan.

Information-processing and long-term storage. Sousa (2006) explained that working memory connects to previous experiences and decides whether the information is meaningful and whether it makes sense. Information is meaningful when it has a clear purpose, whether information is meaningful is very personal. Sense refers to how the information fits into an individual's previous experience and their understanding of the world. Information must be meaningful or make sense for an individual to store it in

working memory and eventually in long-term memory. When information is found to be both meaningful and makes sense, there is an extremely high likelihood that the information will be stored. This is consistent with Draganski et al. (2008, as cited in Frey & Fisher, 2010) who explained that “engaging instruction that reinforces specific pathways makes it easier for new knowledge to be acquired, learned, and recalled” (p. 105).

According to Sousa (2006), information is slowly transferred from working memory to long-term storage. It generally occurs over several hours, on average 18- to 24-hours. The process of encoding usually takes place during deep sleep. This has important implications for teachers, although students may seem to have understood a particular concept during instruction and application, they may not necessarily retain the information. Teachers should check in with students the day following the lesson to verify for retention. Some students may need to review the concept in order to store information in long-term storage. Students should be able to recall information 24-hours later if it was encoded.

It is important for teachers to understand that students will only encode information that is found to make sense and have meaning based on prior and previous experiences. Teachers should consider creating connections for students across subject matters, even those they do not teach in order to create meaningful opportunities that will allow for long-term storage. This is similar to practices employed in Understanding by Design or Backward Design where teachers plan, considering the content and curriculum taught in other classes concurrently, in previous years, and in subsequent years (Graff, 2011; Wiggins & McTighe, 1998). Creating connections between and across subject

matter will allow for learning to be meaningful and will increase likelihood of retention (Sousa, 2006).

In his model, Sousa (2006) delineated between the terms long-term storage and long-term memory. Long-term storage refers to the particular areas in the brain where information is located, whereas long-term memory is the process through which information is stored and retrieved. Long-term storage can be understood as similar to a filing cabinet system where different information is organized and stored. The storage areas are found in many different areas of the brain.

According to Sousa (2006), the information in long-term storage forms every individual's cognitive belief system. The cognitive belief system is an individual's world view. It is how individuals understand and perceive the world in which they live. It is important for teachers to understand that while students may share the same experience, each may interpret it very differently. Found within the cognitive belief system is the self-concept. Self-concept refers to the way an individual views or perceives themselves within their world. Self-concept is shaped by an individual's previous experiences. An individual's self-concept can be positive or negative, with the range following along a continuum. For students, an experience of working hard on a particular test and achieving success, could contribute to developing a more positive self-concept. Previous experiences will also affect a student's willingness to attempt a particular task. A child who has struggled in mathematics and experiences many failures, may be resistant and avoidant of future mathematic tasks. Teachers must look for these avoidant students and provide for them opportunities for success within the given subject area. With increased

experiences of success, students will become more open to learning and willing to attempt tasks that were previously seen as too challenging.

Research to support information-processing model. Frey and Fisher's (2010) review of the literature presented at some of the past and present research from the field of neuroscience and the implications for early childhood education teachers in the area of reading. The review was also found, by these authors, to be pertinent to elementary school teachers. Frey and Fisher also disclosed their skepticism to some of the new neuroscience research and cautioned teachers against the use of newer brain-based learning approaches or programs.

According to Schultz (2003, as cited in Frey & Fisher, 2010), reading is not an innate skill like speaking or listening. Students develop reading skills through instruction and learning experiences. These experiences allow students to develop new neural pathways that will support students in more complex tasks such as connection making and visualizing (Draganski et al., 2006, as cited in Frey & Fisher, 2010). Reading is associated with working memory. The process of becoming a fluent reader is essential to becoming a proficient reader. As students move through the grades, they begin to develop automaticity in their reading. This is crucial because once a student becomes automatic and eventually fluent, it frees up space in the working memory during reading tasks that allows the student to focus on comprehension (Lagerge & Samuels, 1974, as cited in Frey & Fisher, 2010). According to Frey and Fisher (2010), automaticity is about "creating pathways that fire consistently so that the readers working memory can focus on meaning making" (p. 105). Miller's (1956, as cited in Frey & Fisher, 2010) research suggested that automatic reading is supported by working memory.

Frey and Fisher (2010) highlighted the importance of the following instructional strategies: modeling, demonstrating, and thinking aloud. They allow students to see and practice specific skills. This has been found to be effective, especially in helping both struggling and non-struggling readers begin to internalize reading comprehension strategies (Brown, 2008, as cited in Frey & Fisher, 2010).

Working memory is also associated with the operations and problem-solving processes in mathematics (Swanson & Beebe-Frankenberger, 2004). Swanson and Beebe-Frankenberger examined working memory and cognitive processes involved in mathematical problem-solving in first-, second-, and third-grade students. Of the 353 students participated in this study, 132 were identified as being at-risk for serious difficulties in mathematics. The students were given different mathematical problem-solving tasks appropriate for their grade level. The tests were administered over two 45- to 60-minute sessions in small groups by graduate students.

On measures of working memory, third-grade students obtained higher scores than students in second- and first-grade. The students identified as being at-risk scored lower than those not at-risk. Similar results were found on measures of short-term working memory (Swanson & Beebe-Frankenberger, 2004). This is consistent with Sousa's model (2006). Swanson and Beebe-Frankenberger explained that, whereas students likely obtained higher scores due to their age and working memory capacity, the importance of instruction and learning experiences contributed to children's problem-solving skills was also highlighted. The correlational relationship between working memory and mathematical problem-solving was strong. In their analysis of students at-risk for serious mathematic difficulties, Swanson and Beebe-Frankenberger (2004) found

they had difficulty filtering out the unnecessary information from entering working memory, removing focus from the central elements of the task. This has significant implications for mathematics teachers. As the students move into the upper grades and problems become more complex this may impact their ability to problem-solve. It is vital that teachers understand how working memory influences a student's ability to learn and retain new information.

Assessment

As discussed in the readiness section, pre-assessments are an important element in differentiation that aid teachers in determining in which areas a student is struggling. The next step in assessment is to consistently administer formative and summative assessments throughout a teaching unit.

Formative Assessments

Formative or ongoing assessments are not necessarily used for grading purposes but provide teachers with the ability to evaluate their teaching and its impact on their students. These assessments are often referred to as assessments for learning as they are meant to be used as a teaching tool rather than for evaluation (Earle, 2014). There are two categories of ongoing assessments, formal and informal. Formal assessments come in several forms such as, interest surveys, frayer diagrams, quizzes, and journal prompts, whereas informal assessments comes in formats such as response cards or hand signals (Moon, 2010). They are a method for teachers to reflect on their teaching practices, track individual and class progress, and to promote metacognitive skills in students. Formative assessments provide the teacher with an idea of performance levels in the classroom. They allow teachers to understand the gaps between a student's current knowledge and

the desired learning goals (Yin, Shavelson, Ayala, Ruiz-Primo, Brandon, & Furtak, 2008). This way teachers can collect data that tracks a student's progress. Without these evaluations teachers are working under the assumption that all students are meeting the academic expectations of the unit. These assumptions can prevent students from achieving mastery, produce a lack of motivation because learning is not accessible to their developmental needs, develop problematic and defiant behavior, and last it widens the achievement gap (Moon, 2010).

Administering formative assessments is not enough to make an impact on student learning. The assessment is just a guide for teachers to differentiate their instruction and adapt to the need of their learners. The next step is to use the data collected to close the gaps in learning. In order for students to benefit from formative assessments, teachers need to provide effective feedback that allows students to make sense of their learning and make improvements. This is similar Simons and Klein (2007) who emphasized that scaffolds are effective when in conjunction with feedback and questioning. According to Tomlinson and Moon (2013), effective feedback should be clearly communicated to students and should build trust between the student and teacher. Feedback should also be easy to understand, specific, and is targeted toward the KUDs in question. Feedback should also be differentiated in accordance to the learning goals of the unit, frequent, and encourage students to apply teacher suggestions which makes them active members in their own learning. Formative assessments provide students with clear instructions that are in line with their readiness levels and develops an understanding of what to do next.

“Effective feedback is focused at an appropriate level (which will differ with the task and the child); and involves the student self-assessment as a catalyst for self-

regulation” (Brookhart, Moss, & Long, 2010, p. 41). The student is an important element in the formative assessment process. Feedback does not only have to come from the teacher but can come from an informed and confident peer. It is the opportunity for students to move away from teacher reliance and become more autonomous with their learning. Effective feedback should consider teacher and student answers to the following questions, Where am I going, how am I going, and where to next (Hattie & Timperley, 2007)? “Where am I going?” refers to be goals of the unit. Students will be more successful when they know the goals of the unit and will be more likely to seek out feedback during a lesson. “How am I going?” refers to either a teacher or peer providing information about the progress or how to continue with the task. “Where to Next?” is a question that has a great impact on learning because it leads to better self-regulation. Students at this point should be given tasks that are more challenging, develop a deeper understanding, and enhance self-regulation. Having students be a part of assessment provides them with a sense of autonomy and fosters more independent learners. This is consistent with Mitchell (1993) who stated that students maintain interest long-term if they are involved in their learning. Therefore, students should be active members in each step of the learning process.

Hattie and Timperley (2007) summarized the results of 12 meta-analyses on the influence of feedback. These meta-analyses were made up of 196 studies that measured the impact of feedback on achievement. The average effect size was 0.79, however, it was found that certain types of feedback are more effective than others. Hattie’s (1999) meta-analyses of 500 studies found that the most effective types of feedback provide reinforcement to student learning, are computer-based instructional feedback, and are

related to the goals of the unit (Hattie & Timperley, 2007). Feedback that included praise, consequences, or extrinsic rewards did not produce a significant effect on achievement.

Brookhart et al. (2010) examined the effect of professional development on teachers in regard to formative assessment and the subsequent effects on students. Six remedial reading teachers were given professional development through an inquiry process. Teachers discussed how they currently assessed, sought to learn new information, and then experimented with a variety of strategies. Overall teachers had positive experiences working with formative assessments that led them to be more mindful of analyzing formative assessments, more specific with feedback, and better record keepers. Kindergarten and grade one at-risk students in remedial reading classes were exposed to formative assessments. Data were collected using the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 2002).

Kindergarten students did not improve in alphabet naming, the assumption for these results is that the measure tested was letter naming and that after a whole year of instruction, students know their letters. Grade 1 students who were exposed to formative assessments showed an increase in sounding out words and motivation. Formative assessments became a vital part of literacy that aided both students and teachers to discover the needs of a student and the steps to remediate learning. This will lead to closing the gaps in students' knowledge which is consistent with goals of formative assessments set out in Tomlinson and Moon (2013).

Yin et al. (2008) conducted a study that examined the effects of formative assessments on achievement and motivation on teachers and their students. The teachers

used formal assessments that were embedded into their science unit. Twelve teachers and their classes were assigned to either an experimental group that used formative assessments or to a control group that did not implement ongoing assessments. The experimental group did not have a significant effect on either achievement or motivation. Teachers in both groups had varied outcomes on students, some teachers in the control group used informal formative assessments and provided students with useful feedback, while some teachers in the experimental group did not use formative assessments effectively. Despite inconsistent results in regard to the impact of formative assessment on achievement, the authors stated that it was not enough to just implement assessments. More vital, is that teachers need to use formative assessments to adapt their teaching practices to fit the needs of their students. This finding supports the need for effective feedback as an essential component of formative assessment (Hattie & Timperly, 2007; Tomlinson & Moon, 2013).

Doubet (2012) focused on one school's approach to differentiation with the use of formative assessments. During a professional development workshop teachers learned how to develop assessments based on each of the KUDs and were expected to implement them in the classroom before the next workshop. Teachers were then able to collaborate, share experiences with their colleagues, and discuss misconceptions. Teachers then managed the data that were collected from formative assessments. From these data they discussed how to adapt materials and form groups of students based on readiness levels. Teachers' reflections of this process yielded four perspectives. Formative assessments developed teachers' skills in understanding their students, assessments made instruction more efficient, they helped teachers become differentiated instructors, and ongoing

assessments were easy to use. Ongoing assessments are an important facet of the classroom dynamic and help both teachers and students to set and meet specific learning objectives.

Summative assessments. Summative assessments are more formal in nature and are used to evaluate the mastery level of a student at the end of an instructional period. Summative assessments are often referred to as assessments of learning as they are evaluative tools (Earle, 2014). They are most often in the form of tests or performance assessments, which include portfolios and projects. Although most commonly given at the end of a unit, teachers can formally test throughout the instructional period and use summative assessments as a pre-assessment of the next lesson or unit (Moon, 2010). Summative assessments are used for grading, unlike pre-assessments and formative assessments. The end results of a summative assessments should demonstrate a teacher's instructional effectiveness, a student's mastery of the KUDs, and gaps in knowledge (Tomlinson & Moon, 2013).

Summative assessments are closely aligned with the KUDs of the unit as well as cognitive levels. When differentiating assessments, teachers should follow three core principles as set out by Tomlinson and Moon (2013). The first principle is that the assessment should focus on the same essential knowledge regardless of whether the task was differentiated by readiness, interest, or learning profiles. The second principle is that students should be allowed the opportunity to be exposed to varying assessments that reveal the mastery of the KUDs associated with the unit. The grading scheme should be the same for all students despite the type of differentiation provided, unless the student was on a modified program.

Summative assessments have often been criticized when used as the sole method of evaluation. Earl (2003) claimed that summative assessments are used to test accuracy rather than the mastery of new knowledge and feedback is often in grades, which does not lead to more self-regulated learning. Black, Harrison, Hodgen, Marshall, and Serret (2011) evaluated how teachers can alter summative assessments to make them efficient and effective. Eighteen teachers were involved in a qualitative, longitudinal study, which determined five elements that improve and make summative assessments more valuable to teachers. The design of a summative assessment should be authentic and in a portfolio format which combines task assessments and test results. The task needs to be clear and properly implemented. Students should have an understanding and prior experience with a similar task. All objectives in a subject area cannot be analyzed with one test, therefore, a student should be exposed to a wide range of tasks. Measures for assessments need to be consistent and teachers felt they would benefit if the curriculum criteria was more specific. In order to facilitate consistency, schools should use standardization and moderation. Standardization is training in which teachers assess samples of students' work, with the assumption that after this training teachers understand how to apply the same criteria to various other tasks. Modernization is more intensive training that involves blind-marking during several meetings throughout the school year. This provides teachers with opportunity to collaborate with peers and create a consistent standard for assessment.

Pre-assessments, formative, and summative assessments are essential components in becoming an effective teacher who supports a differentiated approach. All three of these formats of assessment should be used to understand the students and their needs. If

learning is an ongoing process the same rule should apply to assessment. “Once you have a sense of what each student holds as ‘given’ or ‘known’ and what he or she needs in order to learn, differentiation is no longer an option it is an obvious response” (Earle, 2003, p. 86).

Understanding by Design

Classrooms are diverse; students come from various backgrounds, have different learning preferences, different abilities, and interests. Many factors contribute to the diversity of today’s classrooms. Teachers are tasked with meeting the needs of each learner in their classroom, all the while being guided by the provincial standards that provide the framework for their instruction. In considering the standards, the students’ needs, and the curriculum, effective teachers take on the role of designers (Wiggins & McTighe, 1998). As designers, they must focus on what they will be teaching and how, as well as the assessments that will provide evidence of lasting understanding (Tomlinson & McTighe, 2006). At the planning stage, teachers must balance the needs of their students, the governmental requirements, materials or resources needed, and use their knowledge to plan the sequence of their instruction in order for all students to maximize their learning (Graff, 2011).

Understanding by Design (UbD) was developed by Wiggins and McTighe (1998), as a curriculum-design model that is anchored in backward design. The idea of backward design is not new to the field of education, this approach to curriculum planning was first introduced by Tyler in 1949 (as cited in Wiggins & McTighe, 1998). This approach to planning instruction and learning means “starting with the end goal in mind” (p. 9). By beginning the process of planning with the end goal, it allows teachers to then decide

what materials, instruction, and assessments will be required to achieve the end goal.

Long-term goals must be established in order for teachers to determine the parts of the unit will require fewer details and which will need greater exploration for lasting understanding (Graff, 2011).

Wigging and McTighe (1998) viewed backward design as task analysis for instruction. Task analysis involves breaking things down into their component parts in order to establish the procedures and steps needed to carry out a given task. Backward design forces teachers to break down all the component part of their units and organize them in a sequence that will maximize the acquisition of knowledge, skills, and lasting understanding. The process of Understanding by Design involves identifying three elements: “identifying the desired results, determining acceptable evidence, and planning learning experiences and instruction” (p. 9). Their approach to backward design is focused around the need for enhancing lasting student understanding. Lasting understanding refers to the students’ ability to use the knowledge, skills, and understandings beyond the classroom (Graff, 2011; Wiggins & McTighe, 1998).

According to Shulman (1986), teachers must possess subject knowledge, pedagogical-content knowledge, and curricular knowledge to plan effectively (as cited in Graff, 2011). Subject knowledge is related to the specific subject, all the facts, details, and deep understandings related to the subject matter. Pedagogical-content knowledge refers to the knowledge the teacher has of the various ways in which the content can be presented and represented. It includes the common misconceptions and conceptions that students will bring to the topic as well as the most effective strategies for reshaping student understanding. Curricular knowledge refers to the teacher’s knowledge of the

content taught across the grade level as well as the content taught in the preceding and subsequent years of schooling. Teachers must know what is taught the year before and after they teach the students, as well as what students are currently learning in their other classes. Subject, pedagogical, and curricular knowledge are crucial to curriculum planning.

The First Stage of Planning

The first step in the UbD is to “identify the desired results” (Wiggins & McTighe, 1998, p. 9). In considering the desired end results, one must think through what students are currently learning in other classes, the knowledge they are bringing to the classroom from their previous learning experiences, and the expectations for subsequent learning. At this stage, teachers must think about what Wiggins and McTighe referred to as the “big ideas, essential questions, and lasting understandings” (p. 10). Teachers must identify what they want their students to: “know, understand and do” at the end of the unit (p. 11). Using the UbD framework to identify the desired results, teachers learn to differentiate between three types of knowledge. The first type is “what is worth being familiar with” (p. 10) which refers to the broad knowledge that is necessary in order to delve deeper into the topic. Next, teachers identify “what is important to know and do” (p. 10) and determine the specific knowledge and skills that students will need to acquire, in order to achieve the end goal. Finally, the most important step is identifying the “enduring understanding” (p. 10) for the unit. This is identifying the essential questions that student will grapple with far beyond the four walls of the classroom. This is the knowledge that students will carry with them even after forgetting many of the details taught (Wiggins & McTighe, 1998).

The first step in the UbD is about prioritizing the information that is to be taught. Teachers consider how the students will use the knowledge acquired in the real-world, what parts will need exploration and deep discovery, how it relates to life beyond the classroom, and how the topic or idea will engage students (Wiggins & McTighe, 1998). It provides the foundation for the next two stages of curriculum planning.

The Second Stage of Planning

Once the desired results have been identified, the next stage is to “determine acceptable evidence” (Wiggins & McTighe, 1998, p. 9). UbD encourages teachers to reflect on the evidence that will provide validation that students have acquired the desired results before determining the lessons and activities that will allow them to achieve this goal. Although, many teachers have the common practice of first identifying the lessons and once completed, create an assessment, UbD invites teachers to first think of themselves as evaluators of learning. This is not any easy task for teachers, it take conscious and deliberate action to break the instinct to focus on lesson and activity planning. Assessments should be established before deciding what lessons should be taught and when, to allow for units to be logical, clear, and focused around deep and lasting understanding. Using the UbD approach, assessments are ongoing. They are used by teachers as feedback on student understanding and the quality of their instruction. The assessments provide evidence of student learning, but are also used to guide and shape instruction. This practice is similar to the practices employed in the Response to Intervention Model (Seedorf, 2014), where progress-monitoring assessments provide the teacher with feedback and allows them to address learning needs, find appropriate interventions, and to evaluate the efficiency of interventions.

Assessments in the UbD approach are on a continuum (Wiggins & McTighe, 1998). They include both informal and formal assessments. Informal assessment refers to classroom practices such as teacher check-ins, classroom observations, and classroom discussions. Formal assessments refer to quizzes and tests, academic tasks that require critical thinking, and authentic tasks or projects. Effective teachers assess learning often and through various means. Teachers should collect the data throughout each unit to evaluate each student's progression of learning. Each of the assessments used provides continuous feedback on the progress of each student, it allows the teacher to provide extra instruction for students who have not yet developed the necessary skills or acquired the necessary knowledge. The feedback derived from assessments also allows the teacher to provide activities to match the ZPD of each student.

Each type of assessment will provide different feedback on the students' progress. Traditional evaluation methods such as quizzes and tests should be used to evaluate the acquisition of knowledge and skills that will be required for academic tasks and for the authentic project at the end of the unit. Academic tasks assess knowledge and skills as well as lasting understanding. The authentic tasks or projects reflect real-world application. These tasks require students to apply the knowledge they have acquired to a new situation. Performance tasks focus on the transfer of skills and knowledge across situations (Tomlinson & McTighe, 2006). These tasks allow the students to demonstrate their understanding within meaningful contexts (Wiggins & McTighe, 1998).

The Third Stage of Planning

The final stage of UbD is to “plan the learning experiences and instruction” (Wiggins & McTighe, 1998, p. 9). Teachers must reflect upon the activities that will

allow students to acquire the knowledge and the skills they will need in order achieve the desired end results of the unit. Teachers will reflect upon the sequence of their instruction and the most effective methods for teaching the given subject. According to Wiggins and McTighe, “teaching is a means to an end. Having a clear goal helps us as educators to focus our planning and guide purposeful action toward the intended results” (p. 13).

It is at this stage of planning that teachers need to draw on their knowledge of their students and DI practices in order to plan effective instruction (Tomlinson & McTighe, 2006). Teachers within a DI context are constantly working with their students and have established strong, positive teacher-student relationships. They have created a positive learning environment that allows all learners to feel safe and comfortable. In order to engage in learning and take risks, students must feel comfortable within their environment. Teachers know their students’ readiness level and learning profiles, which enables the provision of effective instruction for each student. They also attend to student interests and possess a strong knowledge of effective instructional methods. During this process teachers will establish tiered-learning activities that will address readiness levels, as well as activities to address varied interests, all while providing quality instruction that attends to learning preferences. Drawing on this knowledge will allow for the careful sequencing of lessons, activities, and tasks, allowing all learners to have access to meaningful learning experiences.

Understanding by Design in the Classroom

Graff’s (2011) work looked at the impact of UbD on 30 newly graduated teachers’ practices in their first years of teaching. The graduates had received instruction

in the UbD framework during their last year of education. More than half of teachers felt that UbD provided them with the skills and knowledge they needed in order to effectively plan and carry out instruction. They were able to meet the needs of their students, because they shifted their focus from what needed to be taught, to why it was important to be taught. The focus became transfer of learning, rather than transmission of information. It allowed the new teachers to stay focused on the big picture throughout the unit. A third of teachers described becoming more reflective in their practices, allowing the assessments to guide the quality and efficiency of their instruction.

Many of the barriers to teachers' implementation of the UbD were their lack of subject knowledge, pedagogical-content knowledge, and curriculum knowledge. Teachers noted their lack of knowledge of the curriculum across grades and subjects. Teachers must know more than the facts, they must understand the reasoning behind the facts in order to help students grapple with the essential questions. Teachers must develop their knowledge within their subject matter in order to avoid relying on prepackaged materials (Graff, 2011). UbD allows teachers to focus on the knowledge, skills, and understandings that students will develop in their classrooms rather than on covering the content.

Kelting-Gibson (2005) looked at the effects of UbD versus the traditional backward design steps for curriculum planning for preservice teachers. The UbD framework builds on the work of traditional backward design, which involves the same steps in a different order. Traditional methods begin with defining the desired end results, then the sequence of learning activities as well as experiences and finally designing the assessments that will evaluate student understanding. The UbD approach

differs from other backward design models as it requires teachers to establish the objectives and create assessments before planning lessons and activities. The UbD approach to planning yielded stronger results for student learning than traditional backward design. The preservice teachers who were taught and applied UbD performed better on authentic performance tasks at the end of the unit. These preservice teachers had developed stronger skills and a solid knowledge base that allowed them to develop stronger links between the content taught across their own classes. The preservice teachers who used the UbD approach learned to create appropriate and clear objectives and had a broader knowledge of the types of resources that they could use to carry out their plan (Kelting-Gibson, 2005). These education students better understood how knowledge, skills, and understandings transfer to other learning environments and extend beyond the classroom.

Children come to school every day to learn. They are seeking to understand not the facts and concepts taught, but rather the world in which they live (Tomlinson & McTighe, 2006). Students want to understand their place, as well as their role in the world. They are constantly making sense of their world. Understanding by Design's central focus is on lasting understanding. Its aim is to develop a unit that allows all students to have access to learning, through thoughtful, reflective planning, and responsive teaching.

Effectiveness of Differentiation

The literature and textbooks implore teachers to implement a differentiated approach to teaching in order to meet the needs of the diverse learners in today's classroom. We observed that there have been a limited number of studies on the

effectiveness of DI. For the purposes of this review, we have also included a study on small-group instruction, a strategy commonly used in DI (Tomlinson & McTighe, 2006). DI is an approach to teaching that involves the use of several strategies. The studies that follow evaluated the use of DI strategies within the classroom.

Roy, Guay, and Valois's (2013) purpose was to develop and validate a Differentiated Instruction Scale and to investigate the DI strategies teachers were currently using in their classrooms. The study took place in Québec with 125 elementary school teachers. The participants were from different areas within the province. The scale focused on the adaptations addressing the needs of all students, including advanced and lower functioning students. In examining the teacher's self-reports, the authors found that instructional adaptations and academic progress monitoring were positively linked to teacher partnership, administrative leadership, and support services. Teachers' self-reports revealed that they teachers were more likely to employ a DI approach when the school climate and its resources sufficiently supported implementation. DI strategies were positively linked to promoting student autonomy. Teachers who applied a DI approach in the classroom had a tendency to be more supportive of student autonomy.

The most common strategies implemented by teachers were adjusting the amount of work based on the needs of the student and the provision of study or memory aids and tools. The instructional strategies of fluctuating the complexity of tasks and the adaptation of lesson plans were the least frequently reported strategies. Forty-five percent of teachers used different materials based on the needs of their students frequently and only 38% adapted or varied their assessments (Roy et al., 2013). Many teachers, more than half in this study, tended to use DI strategies that required the least

amount of planning, effort, and organization, rather than seeking the most effective strategy for their students.

Ernest, Thompson, Heckman, Hull, and Yates (2011) looked at the impact of teachers implementing different DI strategies packages and the social validity of DI with 35 special-education teachers who were teaching and receiving their teaching certificate concurrently, and 129 special-education students. The students' progress was evaluated through pre- and post-tests. When the study began only 23% of students had obtained passing grades. At post-test, 97% of students received a passing grade. The average grade at pre-test was 49% and at post-test, the average grade was 80%. The students made significant gains from pre- to post-test across different areas of the curriculum; the greatest gains were achieved in mathematics. The 30% change suggested that implementing DI strategies can provide effective short-terms gains on student achievement across subjects.

Ernest et al. (2011) also examined the social validity of implementing DI. The implementation of DI had strong social validity. The teachers had a desire to reach their students. Teachers reported enjoying their work more when they implemented DI, particularly because their students were gaining more knowledge and stronger skills. The teachers did describe the implementation of DI as requiring more planning time, the students' success validated the extra time and effort required. Teachers reported experiencing greater satisfaction from their work, their students were more engaged, and interested in learning, while behavioral issues decreased in the classroom. Through the implementation of DI strategies, the teachers learned to become more flexible in their

instruction, becoming more responsive teachers. Student progress and success acted as reinforcement of DI and validated their continued use of the approach.

A theme of collaboration amongst teachers and school personnel emerged throughout the results (Ernest et al., 2011). Working with colleagues to develop lesson plans and to share resources made the job of the teachers easier. This is consistent with Roy et al.'s (2013) findings. Teachers need guidance as they begin to implement DI in their classroom. The teachers in Ernest et al.'s (2011) study received guided practice in DI using a systematic research framework under the supervision of a university professor. They learned how to implement research-based practice, based on each student's needs. The process caused teachers to reflect on their previous planning practices. Teachers were able to see the benefits of spending more time planning as it allowed them to provide better instruction and allowed students to make greater academic gains. This highlighted the importance of providing guidance and practice to allow teachers to effectively implement DI.

Connor et al. (2011) looked at the impact of a differentiated instruction approach to literacy instruction on third-grade students' reading comprehension among 33 teachers and 448 students. Students and teachers were randomly assigned to the Individualizing Student Instruction (ISI) intervention or vocabulary invention group. The ISI intervention had three essential components: benchmark assessments; assessment-instruction, which provided teachers with the recommended interventions and number of hours required based on the students' reading scores; and professional development. The vocabulary intervention group received direct vocabulary instruction, however, the intervention did not consider students' reading level or their individual needs.

Students in the ISI condition made significantly greater gains in reading comprehension. In contrast, students in the vocabulary intervention group did not make significantly greater gains on measures of vocabulary (Connor et al., 2011). According to classroom observations, students in the ISI group spent more time working in small groups, receiving individualized focused instruction, than students in the vocabulary group. The teachers assigned to the ISI group were found to be stronger in planning, organizing, and individualizing their instruction than teachers assigned to the vocabulary group. The use of assessments to guide and plan instruction was an effective means of supporting the DI approach. This is consistent with Tomlinson and McTighe's (2006) approach to DI, in that teachers are encouraged to collect data from pre-assessments and ongoing assessments to guide their instruction.

The DI approach often includes the use of small-group instruction as a means of reaching all learners (Tomlinson & McTighe, 2006). Because education is the foundation for life-long learning, it is important to consider not only whether the student currently possesses the necessary skills for the given academic year but, rather, whether their skills will transfer across different settings. Pai, Sears, and Maeda's (2015) meta-analysis studied the effects of small-group learning on transfer. Small-group learning refers to students learning in groups of two to five students. One of the benefits to group work is that it lends itself to promoting lasting understanding. When students work in small groups they learn how different perspectives can change the ways in which individuals interpret and assimilate new information. This strategy encourages students to look at and really consider, one another's perspective. Students need to problem-solve as a team; they must negotiate different perspectives in order to come to a common understanding.

Pai et al. (2015) found that transfer was superior in small-group learning compared to independent learning. This suggested that the support for transfer may be an organic function of using small-group learning. There were no significant differences found between the structured or unstructured approaches to small-group learning.

This study's results directly linked to the approach to integrating UbD and DI established by Tomlinson and McTighe (2006). The UbD approach to planning for the DI classroom is focused on ensuring that each student can grapple with the essential questions and big ideas for each unit, regardless of their readiness level. The goal of DI and UbD, as explained by Tomlinson and McTighe, is to provide instruction that leads to enduring understanding or transfer as it is referred to in Pai et al. (2015). The results suggested that transfer can be achieved through small-group learning experiences.

Reis, McCoach, Little, Muller and Kaniskan (2011) examined the impact of a differentiated and enriched reading program on students' reading fluency and comprehension. This study was an extension of previous research. The study was conducted in five schools with students ranging from second- to fifth- grade. Sixty-three teachers participated in the study. The 70 classrooms included in the study were randomly assigned to the SEM-R group or the control group. SEM-R is a school-wide enrichment reading framework. The interventions took place over five months, and began within the first two weeks of school. Teachers in the SEM-R groups received six-hours of professional development and received 250 books for each of their classroom libraries. The SEM-R intervention had three parts: exposure to literature; a differentiated approach to reading that included direct strategy instruction; and enriched student-selected activities and projects that related to reading. The students were provided with

enrichment activities that considered their interests, learning styles, and readiness levels. This is consistent with Tomlinson's (2003) approach to DI, in which students are differentiated by interest, readiness level, and learning style.

The schools had a two-hour daily language-arts program; the control group maintained the current practices. The SEM-R groups only provided one-hour of the regular language-arts program and used the second hour to provide the intervention. The students' reading skills were assessed through standardized reading assessments and classroom observations were made to ensure that the SEM-R interventions were carried out with fidelity. Fidelity refers to how faithful the teacher was in following the program guidelines and practices. The observations revealed that most teachers had above 80% program fidelity. Qualitative data were also collected through observations, student logs, and interviews with teachers and school personnel (Reis et al., 2011).

Reis et al. (2011) found in the high-poverty urban school, students in the SEM-R intervention had made significantly greater gains in reading fluency and comprehension as compared to their peers in the control group. Students in the SEM-R group at one of the suburban schools achieved significantly greater gains in reading fluency. In the remaining three schools, no significant differences were found between the SEM-R and control groups. None of the control groups outperformed the SEM-R groups and none of the SEM-R students showed a decrease in reading fluency or comprehension. This suggested that up to four- or five-hours a week of whole-class, daily language-arts instruction could be eliminated in favor of high interest, differentiated reading instruction without detriment to reading-achievement scores. In the interviews, teachers and principals expressed that students in the SEM-R developed more positive attitudes toward

reading. The teachers reported that the intervention inspired change in the climate of their classroom during reading. The students who experienced more enjoyment and became more engaged in reading tasks.

Throughout the studies two themes emerged. The first theme was the importance of collaboration, support, guidance, and practice required to effectively implement DI in the classroom (Roy et al., 2013; Ernest et al., 2011; Reis et al., 2011). Professional development is essential for the implementation of specific interventions and for the implementation of DI. When teachers feel sufficiently supported and have the necessary resources, they can effectively implement the DI approach.

The second theme was the increased level of engagement experienced by students in the DI classroom. The studies (Ernest et al., 2011; Reis et al., 2011) highlighted the changes that occurred with students when DI was implemented. The students became more engaged and experienced more enjoyment. This theme was important, not only because of the impact on students, but also because of its impact on teachers. Students became more engaged and developed more positive attitudes towards learning. This feedback reinforced the teachers' implementation of DI. The change in their classroom climate, allowed them to see that responsive teaching and planning was an effective way to reach their students.

Barriers to Differentiation

Although there are many benefits to implementing differentiated instruction, some barriers arise. Differentiated instruction requires a lot of time and dedication. It needs dedicated teachers who are willing to alter their teaching methods and spend a great deal of time implementing new routines and learning new techniques to reach each student in

their classrooms. There are also potential issues that arise with parents or administration that need to be addressed in order for a differentiated classroom to function smoothly. It is a system that needs various entities to be in place so as to create a workable space for both students and teachers.

Tobin and Tippet (2014) conducted a study with five in-service teachers to understand perceptions of both possibilities and barriers of differentiated instruction in an elementary science class. Teachers were provided with three DI workshops and were given time to plan lessons in accordance with the science curriculum. Results yielded both benefits and possible barriers to having a DI classroom. One possible barrier found were the teachers' fears and insecurities that arose while facilitating a DI classroom. Teachers were scared about their lack of experience and wrapping their heads around the various ways to implement DI. Other barriers revealed by teachers were "lack of time, curricular and assessment demands as well as the lack of resources" (p. 438). Teachers worried that DI was time-consuming and therefore there would not be enough time to cover all the curriculum requirements. The last hurdle expressed by teachers was the willingness to embrace new ideas and their openness to change, which led to some misconstrued messages in regard to the implementation of DI. One misunderstanding was that teachers thought DI was only meant for low-level learners rather than for every type of learner.

Tomlinson's (1995) qualitative case study sought to understand how teachers reacted to the district's call for differentiated classrooms. The data were collected at Midland Middle School (pseudonym) from staff, parents, and students during an 18-month period. The first problem was the ambiguity and lack of clarity with the DI

definition. Most teachers were under the impression that DI referred to the small modifications they made with both high- and low-functioning students. A concrete definition needs to be established before teachers can understand and properly implement differentiation. Barriers to DI were separated into three categories: administrative, issues of changing expectations, and issues of professional support. An administrative barrier that arose was the lack of flexible time during the day to adequately incorporate lengthy DI lessons. Teachers at this school were working with a seven-block schedule and were not given flexible blocks of time to effectively facilitate a DI lesson. Issues of expectations, ranged from difficulty with understanding how to assess a student's mastery level, to losing control of the classroom while managing several activities. Accompanied with the fear of concept-based teaching was the stress of not sufficiently covering the curriculum, in order to have students prepared for the upcoming standardized tests. In terms of issues with professional support, teachers felt the need for a step-by-step or a teaching model to support their facilitation of DI. Teachers felt overwhelmed by the amount of strategies that could be used to differentiate and sought guidance on the ways to use these strategies efficiently. Teachers benefited from watching videotaped lessons of a DI classroom and requested continuous assistance with DI as well as consistent feedback.

Teacher Education

Teacher attitude toward DI is a barrier that needs to be examined. Many teachers were hesitant about the implementation and being effective with new strategies that seemed to be time consuming and complex. It would be beneficial for educators to adopt DI as a philosophy rather than just a set of instructional tools (Dixon, Yssel, McConnell,

& Hardin, 2014). Teacher education and teachers' readiness to facilitate varying needs should be examined in order to get a picture of teachers' perspective on DI.

There are several key elements in creating a DI classroom, however, the element that is most needed is an informed and confident teacher. Teachers are not born with the knowledge or ability to differentiate and accommodate for varying needs. "In a study by Mahano, Marino, and Miller (1996) 75% of general education teachers surveyed indicated a lack of instructional skills and educational background in special education" (Dee, 2010, p. 54). Teachers lack knowledge and are not being given opportunities to master new strategies. These teachers are then in charge of modification of lessons, materials, and understanding how each student learns. Without proper instruction, teachers who do not understand the various ways to differentiate or feel inadequate will struggle with DI (Dixon, Yssel, McConnell, & Hardin, 2014). "The conceptualization and implementation of differentiated instruction is complex" (Martin, 2013, p.96). Teachers need to balance several different tasks at one time that hone in on a student's interests, readiness, and learning profile. In order for teachers to become effective differentiation instructors, they need to be taught how it works and how it should be implemented. There are two ways in which teachers can acquire these skills; teacher education programs and through professional development.

Preservice teachers should be equipped with strategies for DI, however, according to Tomlinson (1999) teacher-education programs do not emphasize DI but rather greater importance is given to characteristics of special needs students (as cited in Martin, 2013). Therefore, young teachers are entering the classroom without all the necessary skills that allows them to deal with a diverse classroom as effectively as possible. Teacher-

education programs should teach students about differentiated instruction and be actively engaged in providing teachers with the necessary tools for success (Dixon et al., 2014).

Teachers would benefit from a more concrete definition of DI to understand the true nature of an inclusive classroom. The complexity of differentiation and the lack of teacher education only compound the difficulties in implementation.

Limitations to Teacher Education

Martin (2013) stated that one obstacle with teacher-education programs is that preservice teachers tend not to be exposed to differentiation during field-experiences because most mentor teachers do not differentiate. Due to the lack of public-school experience in differentiation this study explored role-playing DI within a teacher-education program. Students in a one-year master's program were presented with a realistic simulation of a DI classroom and were expected to navigate through the intricacies of instruction and planning with a DI philosophy. Students created draft lessons and were given feedback to modify their planning to fit the needs of all students. They were then made to implement their lessons while classmates played the roles of students that encompassed varying needs. In reflections made by preservice teachers, it was stated that role-play helped teachers to focus on individual learners rather than focus on the collective whole. Preservice teachers showed more focus on their students' well-being and better use of scaffolding strategies with an overall better attitude towards DI. One limitation of this realistic simulation is that there is no longitudinal data to assess whether this type of role-play had long-term effects on teachers.

Santangelo & Tomlinson's (2012) study examined 85 university education faculty members and their perceptions of differentiated instruction. The use of modeling in

teacher-education program and its benefit for future teachers were tested. Modeling in teacher-education programs has shown to improve teachers' understanding of instructional practices and strategies. Teachers valued many aspects of differentiated instruction such as a fostering a positive environment, tailoring lessons by learning profile, and readiness, however, a comprehensive framework of DI is not being modeled for preservice teachers. For example, teacher educators believe in adapting for readiness but it was found that more attention was given to students in difficulty rather than the gifted who need more challenging tasks. Teacher educators also reported infrequent assessment of learning profile, readiness, and interest, which is in opposition to the principles of DI. Teacher educators are showing positive reactions toward DI, however, their modeling practices are not in line with DI's philosophy and therefore are not being translated adequately to preservice teachers.

Dee (2010) conducted a study to investigate DI skills and lesson plans of 24 preservice elementary-school teachers. Six themes emerged from this study that demonstrated the level and to what extent differentiated practices are being used in teacher-education programs. First, lessons were written for whole-group instruction and then adapted as the lesson was taking place. Next, if accommodations were provided it was usually in the form of group work which points to lessons that were not focused on individual needs. Third, preservice teachers lacked an understanding of inclusion and terminology. For example, preservice teachers interchangeably used words such as accommodate, modify, and differentiate which shows a lack of understanding. One student stated she would modify the time allowed to complete a task, this indicates confusion with regard to the terminology of inclusion. Fourth, student-teachers believed

that the use of manipulatives and the understanding of Gardner's theory of multiple intelligences (1993) fulfilled the requirements of a DI classroom. Fifth, reflections made by preservice teachers focused more on their own instruction rather than examining student learning. The last theme that emerged was the absence of meaningful planning for students with disabilities. Overall, this study revealed the lack of preparedness in both preservice and in-service teachers and that teacher-education programs have not given enough instructional time to DI or in dealing with a diverse classroom.

Teacher efficacy is defined as “a judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated” (Tschannen-Moran & Woolfolk, 2001, p.783, as cited in Dixon et al., & 2014). Dixon et al. (2014) examined the relationship between teacher efficacy and DI as well as the role of professional development in regard to DI practices with 41 participants. Teachers who had experienced more professional development in differentiation felt more comfortable and successful with implementing DI in their classrooms. Teachers who have ten or more hours of experience with a strategy or who have been exposed to DI in a workshop setting are able to implement DI more effectively in the classroom. More efficacious teachers are more likely to be comfortable with DI in their classroom. This study supported the notion that teachers need professional development to become more adept with differentiation.

Without knowledgeable teachers, there will be no differentiation. Teacher-education programs and school boards need to provide their teachers with as much knowledge as possible to stay abreast with the ever-changing classroom.

Québec Education Program and Differentiation

The Québec Education Program (QEP) was developed in 2001 to address the growing diversity in Québec society. The QEP is a research-based program that is defined as “the official ministerial document that defines the learnings essential for the education of young people” (Elementary QEP, 2001, p. 2). It was designed as a competency-based approach to allow for more authentic and flexible learning for all students. Learning in the QEP is seen as a process in which students take ownership in actively building their knowledge. The QEP is divided into five subject areas; “languages; mathematics, science and technologies; social sciences; arts education; and personal development” (p. 5). This approach seeks to integrate learning across subjects allowing students to make connections and apply learning strategies to different areas of the curriculum.

The QEP and the DI approach are similar because they are both grounded in the constructivist theory. The QEP was designed around the core elements of a differentiated approach that consider the readiness, interests, and learning styles of a student. Its overall objective is for every student to achieve individual academic success as well as become a contributing member in Québec society and integrate into the workforce. The QEP separates elementary into three cycles, each cycle is two years long; this lends itself to differentiated practices. Throughout the two-year cycle, students can progress at their own rate along a continuum as they work on each competency. Although the QEP supports the DI framework, “it is the responsibility of the educational institutions to provide all students with an educational environment commensurate with their interests, aptitudes and needs by differentiating instruction and offering a broader range of educational options” (Elementary QEP, 2001, p. 5).

In line with both DI and the QEP, effective teachers need to provide students with problem-solving strategies that transfer across the curriculum and beyond. The QEP emphasized high-quality instruction that is focused on the provision of learning experiences that allow students to progress based on their readiness levels. “In this perspective, learnings have to be differentiated in order to meet individual educational requirements” (Elementary QEP, 2001, p. 4). Therefore, teachers should focus their attention on each student, in order to use an approach that is tailored toward their skills while considering prior knowledge and interests. In order for assessments to follow QEP guidelines, evaluations need to be based on competencies. Assessments should be formative and summative in order to gauge both student learning and guide teachers’ instructional practices. The QEP encourages self-evaluation and peer-evaluation to help students better understand the learning process and provide them with strategies to maximize their learning.

The ultimate goal of the QEP is for each student to receive a quality education that maintains a high standard while acknowledging the readiness levels of every student. By following a DI approach that is in line with the competencies set out by the QEP each student should have the opportunity to reach their potential and become contributing members to society regardless of the path they choose.

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The DI Approach: Pathways to Student Success
Workshop Series & Manual

Created by:
Simrin Aulakh
&
Catherine Meloche

Dear Teachers and School Professionals,

Thank you for choosing to take part in our workshop series The Differentiated Instruction Approach: Pathways to Student Success. Simrin and Catherine both work in the Québec school system. Simrin is an elementary school teacher who completed a Bachelors of Education at McGill University. Catherine is a remedial specialist who completed a Bachelors of Arts in Child Studies at Concordia University. We, like many of you, entered the system with the dream of helping each of our students reach their full potential but once we began to teach, we felt overwhelmed and under prepared to meet the needs of each of our students. We both decided, after a few years in the field, to return to university and complete a Master of Education in Educational Psychology at McGill University. Throughout the program, we took many courses that allowed us to develop our knowledge and skill set to teach in an inclusive classroom. During the program we continued to work in the field, bringing the new knowledge, skills, and strategies we acquired into our classrooms. The courses and the projects we completed lead us to begin our research in the area of differentiated instruction.

Teachers and school professionals are always looking for new information and strategies that can help their students make meaningful gains. We have designed this series with teachers and school professionals in mind. We have tried to implement a DI approach in our workshop series. Throughout the workshops you will receive pre-assessments and assessments, which will guide us to ensure that each of you will gain the most out of your experience. You will be asked to reflect on the knowledge, resources, and skills that we will be discussing. We will take you through the planning of a unit and tiered learning activities that will match the readiness levels of each of your students. You will be given many opportunities to have guided and hands-on practice with many of the tools and strategies that are a part of a DI approach. There will also be time built into the workshop to discuss your experiences as you begin implement some of the strategies in your classroom. It our hope that each of you will gain valuable knowledge and skills that will allow to meet the needs of each your students.

In this manual you will find a detailed list of the strategies that we have covered in the workshop. Following the workshops, please feel free to contact us, we are available to provide support and guidance. We hope that after this workshop series you will comfortable and motivated to implement this approach in your classroom.

Sincerely,

Simrin & Catherine

Simrin Aulakh- simrin.aulakh@mail.mcgill.ca

Catherine Meloche- catherine.meloche@mail.mcgill.ca

Please note: All references can be found in the reference list of the literature review. With the exception of the following references which were used for the Workshop Series only.

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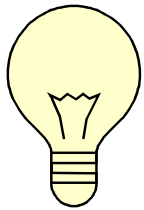
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Workshop 1

Workshop Activity

3-2-1

3 facts or ideas you learned today



2 facts or ideas you are not clear about



1 way you might apply what you've learned

(Adapted from Tomlinson & Moon, 2013)

Workshop 2

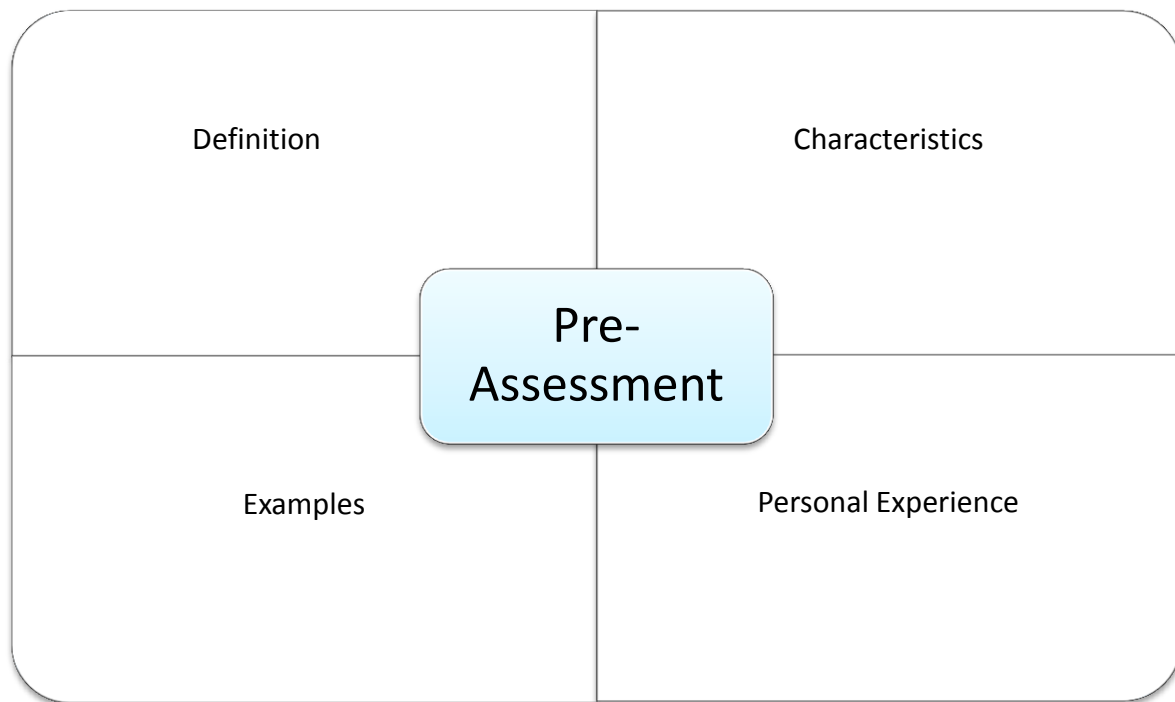
Assessment & Differentiated Instruction

Workshop Activity

Frayer Diagram

Frayer diagrams can be used as a pre-assessment or a formative assessment. This diagram is a quick and easy way to assesses student knowledge.

Fill in the diagram with the knowledge you have about pre-assessments.



Assessments

When using any assessment it is important to consider the data you wish to collect. The wording can be altered or adapted to fit the subject matter. Each assessment will provide different information and not every assessment will fit every subject matter. Choose the assessment that will allow students to demonstrate what they know in the best way.

Hand signals: (Tomlinson & Moon, 2013) This can be used as a pre-assessment or a formative assessment. It is a quick check in that is conducted with the whole class. The teacher asks questions and the children respond with the appropriate hand signal. This may include thumbs up or thumbs down. You can create variations to this technique that work for you and your students. You may want to create hand signal that indicates the child's comfort with the material, letting you know who is still confused, who is starting to catch on and who is ready to move onto new material. Make sure the signals are clear to both you and your students. Make sure your signals are simple. This is a great assessment to have in your tool kit, it is quick, easy, and requires no extra materials.

Response Cards: (Gregory & Chapman, 2007; Tomlinson & Moon, 2013) This can be used as a pre-assessment or a formative assessment. It is a quick check in that is conducted with the whole class. This assessment is similar to the hand signals assessment. The teacher asks questions and the students respond using cards. The cards may be different colours, each colour assigned to a given response. For example, if you were working on cause and effect you might read out a short passage to your class. Each of your students would be holding a blue card for cause and a red card for effect, the students would respond by raising the coloured card which represents the correct answer. Many teachers will use YES/NO cards or TRUE/FALSE cards. We encourage you to create your own variations. Individual white boards can be used for open-ended questions, allowing each student to have an individual response. This is another great assessment to have in your tool kit, it is quick, easy, and requires minimal materials.

KWL Charts: (Tomlinson & Moon, 2013) This graphic organizer is used as a class wide pre-assessment. The KWL chart is used following a class discussion on a particular subject. This pre-assessment could be used when the discussion would act as the introduction to the unit. The chart would be filled out as a class. The K section refers to the students' prior knowledge, what they already know about the topic. The W section refers to what the students want to know, the questions they have about the topic. The L section refers to what the students have learned at the end of the unit, the knowledge they have acquired. As a class, the students would share their current knowledge, the knowledge they want to acquire, and the questions they have, before the unit begins. At the end of the unit, the class would discuss and record in the chart all the knowledge they gained. This assessment is often used by teachers. It is easy to carry out and does not involve time consuming preparation. However, be cautious when using this pre-assessment. It does allow you to gain a general understanding of where your class is as a whole, but it does not give insight into individual gaps in knowledge or misconceptions. An alternative

to using the chart as a class wide assessment would be to have the students fill in individual charts. This would record each student's prior knowledge, misconceptions, and areas of inquiry. Other graphic organizers such as Venn diagrams may be great alternatives to the KWL chart.

Conversations and Observations: (Tomlinson & Moon, 2013) These are informal pre-assessments and formative assessments. During a regular day, teachers spend much of their time talking with and observing their students when they are working, walking in the halls, getting ready for the day or during recess. These discussions and observations often provide valuable insight. Even though they are less formal, they are not less important. During observations and conversations, you can discover your students' interests, the strategies work well for a particular student, the students who are ready for more complex tasks, and what gaps are still present. It is important to record or note what you noticed or learned through your observations and conversations, as it will be extremely helpful in the planning process!

Squaring Off: (Gregory & Chapman, 2007) This is an informal pre-assessment or formative assessment that is conducted with the whole class. In each corner of the room, place a card labelled with word. The words used should reflect what you want the students to share about their knowledge. For example, the cards they could read: I know about this topic; I've never heard of this before; I learned about this last year, but I can't remember much; I'm an expert on this topic. The words or phrases you use should be varied to fit your needs. The students must move around the room and place themselves in the corner that best reflects where they are in process of learning. When they arrive at the corner, they discuss why they chose that corner, and what knowledge they currently have on the topic. We like this assessment because it allows for purposeful movement in the classroom, something that many of our students need. However, like other class wide assessments, it must be used with caution. Take into consideration that students may look to their friends for the "right" or coolest corner to be in, watch them closely as they choose their corners. It is important for you to observe the students and facilitate their discussions. It is a fun and easy assessment that requires little preparation.

Frayer Diagram: (Tomlinson & Moon, 2013) This can be used as a pre-assessment or a formative assessment. This graphic organizer is another quick and easy way to assesses student knowledge, and does not involve time consuming preparation. The student must fill in the four part organizer individually. The categories are usually: define the word or subject, provide characteristics, examples, and non-examples. This assessment provides valuable information when used for vocabulary instruction. Remember that you can use different categories to fit your needs. You may want to alter the wording to make it more relevant to the topic you are working on. This is another simple great way to collect information about your students' knowledge.

Systematic Observations & Interviews: (Tomlinson & Moon, 2013) These can be used as pre-assessments or a formative assessments. Teachers meet with or observe students individually using set guidelines or checklists. We encourage you to set a schedule in order to meet with every student regularly. It is important for your students to understand that this on- on-one time

should not be interrupted. This also helps to foster a stronger relationship with each of your students.

Writing Prompts: (Tomlinson & Moon, 2013) These can be used as a pre-assessment or a formative assessment. Writing prompts can be used to assess what students know and what they want to know. The prompts should be clear and specific. As a pre-assessment, this is an opportunity for your students to tell you exactly what they are curious about. As a formative assessment, student can provide you with feedback on the knowledge they have acquired, what they enjoyed during the learning process, and what questions they still have. An example of a writing prompt might be: in a short paragraph compare and contrast two characters in a story. Another example of a writing prompt might be explain how you use math in your daily life. The prompts are easy to make and do not require extra materials. They can be written on the board. The prompts should be tailored to the specific topic, avoid using vague open-ended questions. Take the time to create new prompts for each assessment. Writing prompts can be used for a variety of subject matters.

Quizzes: (Tomlinson & Moon, 2013; Wiggins & McTighe, 1998) This is a pre-assessment and formative assessment. Teachers create a short quiz for their students on a given topic. When creating a quiz for pre-assessment it should test the skills and prior knowledge needed for the unit. As a formative assessment, the quiz provides should provide you with feedback on where the gaps are in the learning, as well as which individuals will need more instruction in order to continue along the learning journey.

Surveys: (Tomlinson & Moon, 2013) This is a formal pre-assessment. Surveys are similar to quizzes, however, they are usually created by the teacher to assess student interest. They can help you to determine which areas of the subject your students have the most interest in exploring. They can be created for every subject matter. They allow to you get to know your students more individually. We encourage you to use surveys in your classrooms. They are a little more time consuming than some pre-assessments but they provide valuable information. A sample of an interest survey will be reviewed during workshop three.

Thumb it up: (Gregory & Chapman, 2007) This is an informal formative assessment. It is an easy way for teachers to check-in with students that provides quick results. Following a lesson, you would ask your students a question that relates back to the KUDs (what students should be able to know, understand and do) to determine how well they understood the lesson. Students who have a good grasp will be told to give a thumb up, those who have a moderate understanding will be told to give a sideways thumb, students who have a limited understanding will be told to give a thumb down. When you explain the categories to your students, make sure to use language that they can relate to and understand. For example the categories might be “I got it this!”, “I’m starting to get this!”, and “I’m not so sure I get this”. We suggest that you ask your students to have their heads down on their desks for this assessment, this discourages them from looking at their peers’ responses. Here is an example of when and how we might carry out this assessment.

You just taught a lesson on simplifying fractions. You quickly want to determine what your students' comfort levels are with the topic. Thumb it up would be a great way to assess their understanding. You might ask the following question "Who thinks that they can simplify a fraction independently? Give me a thumbs up if you think you can simplify independently, give me a sideways thumb if you think you can simplify with help from a friend or teacher, give me a thumb down if you think you need to review the lesson one more time."

Fist of Five: (Gregory & Chapman, 2007) This is an informal formative assessment. This is similar in practice to Thumb it up. It conducted with the whole class or in a group. Students will hold up fingers to reflect their level of comfort or understanding with the material taught. You will ask your students to use one hand to show how well they understand the topic. A student puts up five fingers when they know the material well enough to explain to someone else. Four fingers for a student who feels they can work on the topic independently. Three fingers would represent a student who feels they need some assistance. A student who displays two fingers feels they need more practice. One finger is for students who feel they are starting to comprehend. We suggest that you ask your students to have their heads down on their desks for this assessment, this discourages them from looking at their peers' responses. Here is an example of this assessment. You just explained to your class the rules and activities for this week's centres. Before sending your students to the centres you want to check-in with your students to ensure the expectations are clear, but it will take far too long to see each of them individually. You decide to use the Fist of Five assessment. You will ask your students to respond to the following question using their fingers "How well did you understand the directions and activities for this week's centres?" Any students who responded with three, two or one finger might stay back and receive further explanation.

Partners A and B: (Gregory & Chapman, 2007) This is an informal formative assessment. This assessment is a great way to have students summarise information following instruction. In this assessment you will divide your students in groups of two. You can decide if it is appropriate for you to choose the partners or whether your students can choose their own partner. One student will be partner A and the other will be partner B. You will ask partner A to start and share one fact they learned with their partner. Then you will ask partner B to share a different fact. You can have partners go back and forth several times. You will decide the appropriate number of times to have students share. As the students share, you will walk around the classroom to observe and listen. You may have students tell the whole class one fact they shared.

Graphic Organizers: (Chapman & King, 2008; Tomlinson & Moon, 2013) This is a formal formative assessment. Graphic organizers help to visually categorize and sort information. There are many different types of graphic organizers, and the one you choose to use should be appropriate for the topic your students are working on. For example, if you are teaching a history class you may want to have your students fill in a time line. In Language Arts you may want to use a Venn Diagram to have students compare two characters. Each student will fill out a graphic organizer on a particular subject or to answer a question you have asked. You will collect all the

organizers for you to review. When you are reviewing the work, you should be looking for specific information. You will decide what criteria you are seeking before you hand out the organizers.

Exit Cards/Slips: (Tomlinson & Moon, 2013) These are quick and easy formal assessments that required little materials. In this assessment you will ask your students one or more questions about the lesson. The questions should require your students to provide short responses. These are usually completed by students at the end of the lesson. Your students can respond on index cards, post-its, loose-leaf paper, etc. They will hand in their responses before moving onto another subject. Here is an example of an exit card. You have just completed a lesson on Canadian currency. You ask your students to draw \$5.00 using coins only.

3-2-1: (Tomlinson & Moon, 2013) This is another quick and easy formal assessment. In this assessment you will ask your students to provide three responses, followed by two responses and end with one response. This assessment can be used following instruction or following a learning activity. For example you may ask students to identify three new facts they learned, two facts they found interesting, and one question they still have. You can create alternatives to meet the needs of your students or the particular subject you are working on. An alternative might be identify three new facts you learned, two misconceptions you had, and an opinion you now have. You can also make your 3-2-1 specific. For example, identify three ways that the Québec population was affected by industrialization, 2 positive changes that arose as a result of industrialization, one negative outcome of industrialization.

Entry Cards: (Tomlinson & Moon, 2013) This is a short formal formative assessment that is conducted as the students enter the classroom or subject. You will post a question on the board or ask a question orally. The question should be related to a topic that was covered the day before. The students will submit their responses before you begin your lesson.

POE exercises: (Tomlinson & Moon, 2013) This is an ongoing formative assessment. This would be used following a demonstration, reading a text, or providing a scenario. You would stop after your introduction and ask students to Predict what they think will happen next. You may ask students to predict as part of a group discussion or independently on paper through writing or drawing. Then you will continue with the task, reminding students to observe what happens. You might ask older students to take notes of their observations. When the demonstration, reading or sharing the scenario is completed you will ask students to explain why their prediction was accurate or not.

Windshield Checks: (Tomlinson & Moon, 2013) This another example of a formative assessment. This assessment does not require a lot of material but will require a thorough explanation the first time it is used. Using a car windshield as an analogy for learning, explain to your students that they will explain their understanding of the topic using one of three windshields. The first windshield is a clear windshield, where you can see everything in front of

you. This means that you have a clear view of the target and understanding of the topic. The second is a “buggy” windshield. This windshield allows you to see the target, but the surrounding information may not be as clear. The third and final windshield is a mud-covered windshield. This windshield is covered, you cannot see the target, you have difficulty understanding the topic. This assessment allows teachers to check-in and for students to have opportunity to evaluate their own learning. It may be helpful to create three different windshields that are placed on a poster and displayed in the classroom. The students can write their name on a post-it and place it on the appropriate windshield. You can also create different variations, alternatives could use a weather analogy (sunny, cloudy, foggy), a stop light analogy, or a gas tank analogy (full, half-full, empty). Be creative!

Authentic Assessment: (Gregory & Chapman, 2007; Tomlinson & McTighe, 2006; Tomlinson & Moon, 2013; Wiggins & McTighe, 1998) This is a summative assessment. Authentic assessments place students in real-life situations. They ask students to respond or address an issue or problem. These assessments ask students to transfer their knowledge to a new situation. The goal of education is to have students be able to apply their knowledge and skills to the outside world. It is important to allow students the opportunity to practice within a real-world context. The situational problems in Mathematics would be an example of an authentic assessment. In an authentic assessment, the student will usually take on an authentic role. For example if you were teaching your students about the Canadian political system, at the end of the unit you might ask them to take on the role of a party leader and to design a political campaign for the next election. Students are required to use critical thinking skills. These assessments should be conducted at the end of the unit.

Here are some examples of formats you can use to help create your authentic assessments:

RAFT

Role	Identify the role your student will carry out in this assessment. For example students may take on the role of journalist, lawyer, teacher, advertiser, doctor etc.
Audience	Provide your students with the audience for their project. For example the audience might be voters, Gazette readers, a client, a patient etc.
Format	The format can be predetermined by you or decided during a student-teacher conference. The format must be appropriate for the role, audience, and topic. For example the format might be to write an article for a newspaper or magazine, create a public service announcement video, create a poster that teaches the rules of punctuation, persuasive speech etc.
Topic	Provide your students with a context for their project. For example, you are a journalist who has been asked to report on the

GRASPS

Goal	The project should be focused around a real-world goal. For example, your goal is to educate youth about the growing environmental issues.
Role	Identify a role for your student to carry out. For example, you are an advertiser.
Audience	Provide your students with the audience for their project. For example, your audience is upper elementary and high school students.
Situation	Outline the realistic context or situation that you will be placing your students in. For example, you have been ask to create a public service campaign that will educate youth about the growing environmental issues facing our population
Products	The product can be predetermined by you or decided during a student-teacher conference. The product must be appropriate for the goal, role, situation, and audience you have given your student. For example, you will create a public service announcement video for upper elementary and high school students.
Standards	The standards by which you will be evaluating the project. You should provide your students with a rubric before they begin their work. The standard will vary depending on the subject matter or assignment.

Performance Assessments: (Gregory & Chapman, 2007; Tomlinson & McTighe, 2006; Tomlinson & Moon, 2013; Wiggins & McTighe, 1998) This is a summative assessment. In this assessment, students are asked to demonstrate what they have learned. Knowledge can be shared in a variety of ways. In a performance assessment, you would provide your students with a variety of performance options. Students might show knowledge through a visual arts performance, creating a video, performing a dance, conducting a lesson for a younger grade, create a poster etc. Performance assessments may also include more traditional summative assessments such as writing an essay, a reflective journal or a long-term project. You must establish clear guidelines for the performance. Students must understand what elements must be included. You may want to create a checklist for your students. You should provide your students with a rubric before they begin their work. Performance assessments should be created using an authentic context.

Portfolios: (Gregory & Chapman, 2007; Tomlinson & Moon, 2013) These are summative assessments. Portfolios are a collection of student work over an extended period of time. A student's portfolio is built over time and demonstrates the progression of the student's learning. They allow you see how well the student understood and applied the content and skills taught. The portfolio assessment encourages you as the teacher to continuously provide your students with feedback on their work. You would be checking in and facilitating dialogue between you, the student and their peers. Students are also expected to stop and reflect on their learning. You students should write a short reflection for each piece of work. By using a portfolio assessment, you are asking the student to take ownership of their learning. You would provide your students with criteria for choosing which pieces of work should be included. Here are some examples of criteria for student selection:

- The piece of work I am most proud of
- Something I am still working on
- My teacher and I chose this together
- I really had to challenge myself in order to complete this work
- Free choice

Portfolios are a great way to track and demonstrate student progress. We encourage you to have your students share their portfolios with their peers and family members. Some teachers might choose to have a portfolio day where students can share their portfolios. Some schools use portfolio presentations in lieu of parent-teacher interview nights.

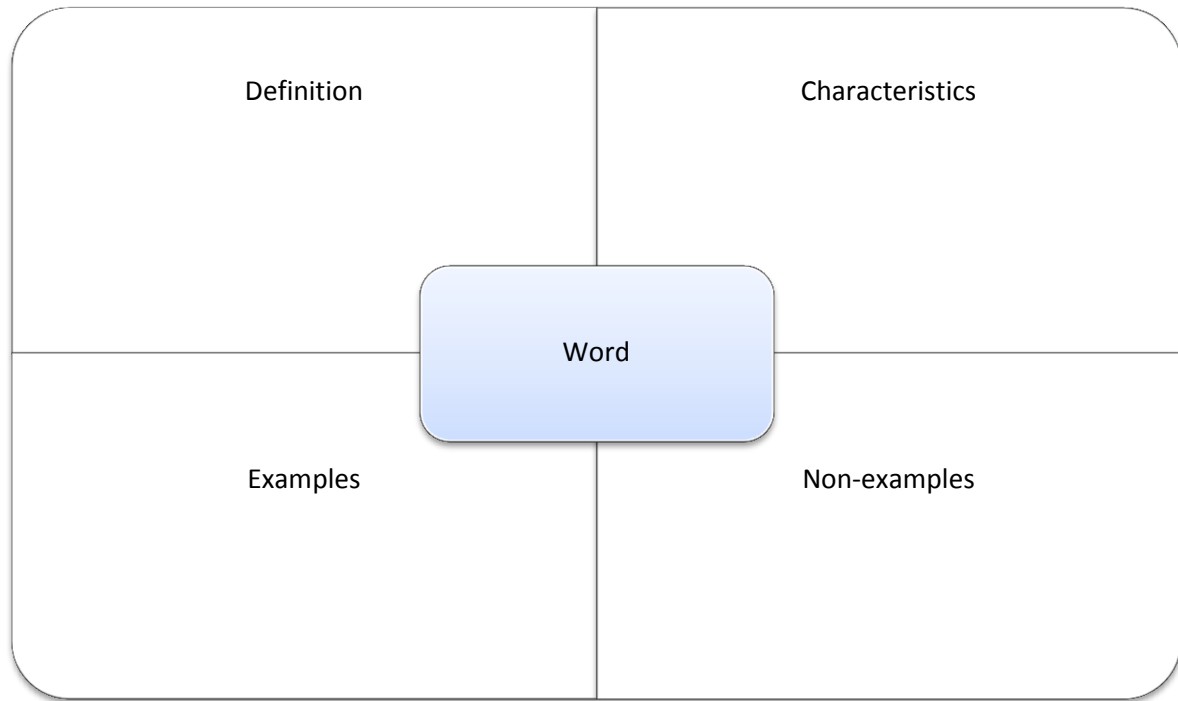
KWL

What I know..... K	What I want to know..... W	What I learned..... L

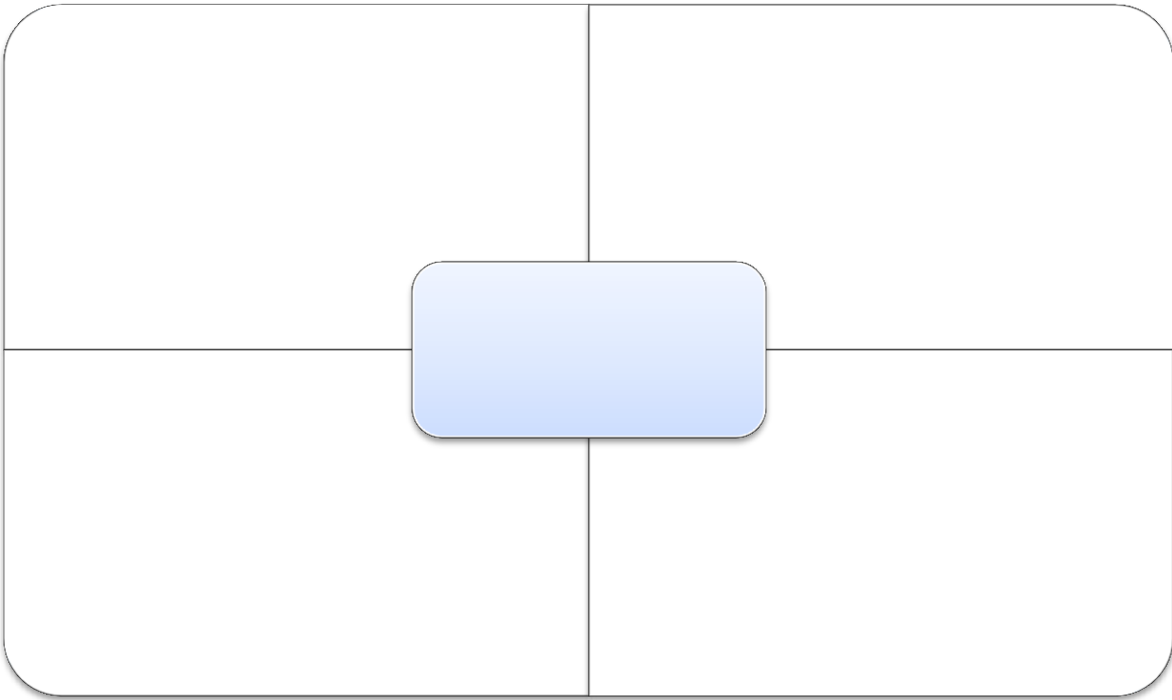
(Adapted from Tomlinson & Moon, 2013)

Fayer Diagram (Adapted from Tomlinson & Moon, 2013)

This is one example of a pre or formative assessment.



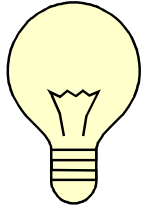
Frayer Diagram



(Adapted from Tomlinson & Moon, 2013)

3-2-1

3 facts or ideas you learned today



2 facts or ideas you are not clear about

1 way you might apply what you've learned

(Adapted from Tomlinson & Moon, 2013)

Depending on the grade level or lesson taught you may want to alter the wording. Here is an alternative example:

3 facts you discovered

2 interesting facts

1 question you still have

Workshop 3

Readiness, Interest & Learning Profile

Workshop Activity

Writing Prompt (Adapted from Tomlinson & Moon, 2013)

On a piece of paper write what you know about student interest.

Tell us about how interest is explored in your classroom.

OR

What questions you have about student interest?

When you are finished, crumple your entry and throw it in the middle of our workshop.

Strategies for Interest

Interest Groups/Centres: (Tomlinson & Moon, 2013) Interest groups or interest centres are designed to allow students to explore a topic, independently or in small groups. The topics usually surround each student's particular area of interest. Interest groups or centres often extend learning, allowing students to explore a specific area of the content. It is important that the guidelines for the learning experiences are clear. Students should be able to work independently, with limited guidance from the teacher. You may want to plan a weekly time for students to work in interest groups or centres.

Here is an example:

Your class is currently studying Canadian history. You have a student or group of students who are particularly interested in understanding the history of how the Canadian Governmental System was created. You decide to design learning experiences for your student to explore this area of the content. You might provide books or articles that will get the student started or design specific activities for the student to carry out.

Anchor Activities: (Chapman & King, 2008) Anchor activities are tasks that have been created for students to work on once the teacher-directed activities are finished. The activities should be anchored in the subject matter that the students are currently studying. They avoid the need for busy work, they keep the students engaged and learning! There should be different anchor activities for students to choose from. Providing choice promotes independence. Anchor activities extend the content. They allow students to explore an area of the subject matter that is interesting. This allows you to have time to work with students who require more support, while your students engage in meaningful learning opportunities.

Here are some examples of anchor activities:

Math- create a word problem for your classmates, create a game for the smart board, create a board game, design a lesson for third grade students

English- write a character sketch on your favourite character, write a story,

Independent Studies: (Tomlinson & Moon, 2013) Independent studies are a great way to address student interests. During independent study, students are asked to choose a topic for study. The student and teacher set goals and establish clear guidelines for work periods. The student and teacher will determine the criteria for evaluation, there will likely be many variations based on the specific requirements for each project. You might have some students who are going to submit a video, others might write a report. You and your students will determine the appropriate format for the final product based on the specific subject or topic being studied. Independent studies offer you a lot of flexibility to differentiate by interest, readiness and learning profile.

Academic Contracts: (Chapman & King, 2008) Academic contracts are a variation of independent studies. They are generally designed for students who have reached a mastery

level and wish to explore a particular area of the content in greater depth. The student must fill out a contract form. The form should include the student's name, the area of study, a space to describe their product or performance. You should provide blank forms that your students can access easily. The students must submit the contract before sitting down for a teacher-student conference. The student and teacher set goals and establish clear guidelines for work periods. The student and teacher will determine the criteria for evaluation, there will likely be many variations based on the specific requirements for each project. You might have some students who are going to submit a video, others might write a report. You and your students will determine the appropriate format for the final product based on the specific subject or topic being studied.

Interest Surveys: (Tomlinson & Moon, 2013) Interest surveys are designed to help teachers get to know their students' interests. There are many different versions available. You can create your own version as well. Interest surveys allow you to see what your students hold as valuable to their learning.

Choice Boards: (Chapman & King, 2008; Tomlinson & McTighe, 2006; Tomlinson & Moon, 2013; Westphal, 2009) Choice boards provide students with a variety of learning activities. These boards can be presented in a variety of ways. Students may be required to choose one or several activities to complete. The activities should allow students to practice a particular skill or to create a product.

Here are some examples of choice boards:

Tic-Tac-Toe (Sample on next page)

When designing a Tic-Tac-Toe you must consider where you place your activities in the organizer. Students will have to choose 3 tasks in line horizontally, vertically or diagonally.

2-5-8 (sample on next page)

When designing a 2-5-8, you will create three levels of activities. Each level will represent a number of points (ie. 2pts, 5pts, 8pts, or 20pts, 50pts, 80pts). You must provide a variety of activities at each level. Your students will have to complete enough activities to add up to a total that you have predetermined. For example you might ask students to choose the activities that they would complete and you will explain that the activities must add up to 15 points.

TIC TAC TOE

(Completed by Catherine Meloche & Simrin Aulakh in EDPI 654, template adapted from Tomlinson & McTighe, 2006)

Create a multiplication or a division problem using decimals (in terms of money).	Create a store for the classroom. You need to provide cost of each item and assume to role of a cashier. Provide each student with a fake \$20 bill.	Present to the class – a plan you make for your ideal day which includes all your favorite activities and figure out the final cost including travel costs.
Find 10 items ranging from \$5 - \$1000 and find the taxes on each item. In a short paragraph explain why the same amount of money in taxes is not applied to each item.	FREE  CHOICE	Create a game for grade 1 on the value of each coin and simple transactions, which include addition and subtraction.
Create a poster to teach your peers the rules of multiplication and division of decimals	Compare the cost of 3 electronic devices between Canada and another country of your choice.	Choose a restaurant and estimate a meal, which would cost including a beverage, an appetizer, a meal and dessert. Compare your estimations to the actual cost.

2 – 5 – 8

(Completed by Catherine Meloche & Simrin Aulakh in 654, template adapted from Westphal, 2009)

You must choose the activities you would like to complete. You will collect points by completing each activity. Make sure you have collected 10 points.

2 POINTS

- Create a sale poster that for a MP3 player cost that \$150. The store is having a 70% off sale. Include the regular price and the reduced price on the poster.
- 39 is what percentage of 70?
- Multiply \$10.20 by 0.25?
- Create a book that outlines the steps to solve the following problem: Your favorite shirt is on sale with a discount 20%. The t-shirt costs \$17.99. What would be the cost of 3 t-shirts?

5 POINTS

- With a 20\$ bill what is the most efficient way to spend your money on toiletries. Use the Walmart and Target's website to find the cost of various items. Explain your choices.
- A set of 3 books cost \$24.50. You want to buy 7 books and you have a budget of \$50. Determine the cost of each book and whether or not you have enough money to buy 7 books.
- Create a powerpoint for grade two that teaches how to add with decimals.
- You make \$50 a week is it reasonable to pay for a 50\$ monthly plan. Consider what you have leftover and other expenses such as food, going the movies, going to mall...etc... Explain your answer.

8 POINTS

- Create a game for the class to play on the Smartboard using Smart Notebook that encompasses money.
- Create a video that explains the steps to adding sales tax and applying discounts.
- Create centers for your classroom that address the following topics:

Adding money- Subtracting money-Multiplying decimals-Dividing decimals-Sales tax-Discounts

Workshop Activity

You have been divided into groups. Choose a topic and create a lesson plan that considers and addresses learning profiles!

Class:	Date:
Subject:	Lesson:
Competencies addressed:	
Learning Objectives:	
Required Materials:	
Outline/Timeline:	
Resources:	
Activities:	
Evaluation:	

Workshop 4

Understanding by Design

Title of Unit		Grade Level	
Curriculum Area		Time Frame	
Developed By			
Identify Desired Results (Stage 1)			
Competencies			
Understandings		Essential Questions	
Overarching Understanding		Overarching	
Students will understand that.... (3-5 understandings)		Understandings turned into key questions	
Related Misconceptions			

Knowledge Students will know...		Skills Students will be able to...	
Assessment Evidence (Stage 2)			
Performance Task Description (separate sheets)			
Goal/Role			
Role/Audience			
Audience/Format			
Situation/Topic			
Product/Performance			
Standards			

Other Evidence (general ideas for ongoing assessment, self-assessment)	
Learning Plan (Stage 3) – include ongoing assessment ideas (*separate sheets)	
Where are your students headed? Where have they been? How will you make sure the students know where they are going? Pre-assessment *	
How will you hook students at the beginning of the unit? Entry Point	

What events will help students experience and explore the big idea and questions in the unit? How will you equip them with needed skills and knowledge? Tiered Activity *	
How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work? Recoding all new information	
How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit? Self-Evaluation *	
How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit? *Differentiate by Learning Profile AND *Differentiate by Interest	

How will you organize and sequence the learning activities to optimize the engagement and achievement of ALL students? Maximize involvement of all students	

(Adapted from Wiggins & McTighe, 1998)

Workshop Activity

Essential Questions and Understandings

Competency: Reads/listens to spoken, written, and media texts (Elementary QEP, 2001)

Unit: Literary Elements

In the space below please notes some of the essential questions and understandings that we developed together during the workshop activity

Essential Questions	Enduring Understandings

Workshop Activity

Creating a RAFT

In the template below please fill in the sections of the RAFT you have created during the workshop.

Role	Identify the role your student will carry out in this assessment.
Audience	Provide your students with the audience for their project.
Format	Determine the format or format options for your students. The format must be appropriate for the role, audience, and topic.
Topic	Provide your students with a context for their project.

(Adapted from Tomlinson & Moon, 2013)

Understanding by Design Unit Completed by Catherine Meloche & Simrin Aulakh in EDPI 654

Title of Unit	Learning How to Use Money	Grade Level	Cycle 3 Year 2
Curriculum Area	Math	Time Frame	4 weeks
Developed By	Catherine Meloche and Simrin Aulakh		
Identify Desired Results (Stage 1)			
Competencies			
Use mathematical reasoning			
Solves a situational problem			
Communicates by using mathematical language			

Understandings		Essential Questions	
Overarching Understanding		Overarching	
Students will understand that.... (3-5 understandings) -Money essential in our daily lives because we need money to purchase goods and services and sustain our basic needs (for example; food, clothing, shelter) -Money is valuable because it is important to understand the correlation between the amount of money you have and the costs of goods and services -Money can be organized in different ways; budgets are used to divide and organize money. Budgets involve knowing what your expenses are and how much money you have to allocate to these given expenses. - Estimation is essential because it allows for quick mental math to determine if we have enough money when purchasing goods.		Understandings turned into key questions • How do we use money in our everyday lives? • Why are budgets important to managing money? • Why is it important to budget? • Why do we need to consider how much money we have in relation to how much we spend?	
Related Misconceptions			
Money is easy to attain When you are working you spend what you want Money never runs out			

Knowledge		Skills	
Students will know...		Students will be able to...	
What is a budget Budgets can be used to organize money Budgets can broken into different categories Taxes are attached to goods and services How to estimate total cost How discounts are applied to items Rules for working with decimals in addition, subtraction, multiplication and division Vocabulary associated with money: tax, discount, rebate, sale, cost, salary, dollar, cents, currency, estimation, toonies, loonies , nickel, dime, quarter		Create a budget Multiply and divide decimals Calculate taxes Estimate cost of items Calculate percentage and its relation to money	
Assessment Evidence (Stage 2)			
Performance Task Description (separate sheets)			
Role	Head of a household; from a given salary and household spending create a budget for groceries		

Audience	A family; Students will be given different family situations and must create a budget that considers the needs of their particular family.
Format	A budget that allocates weekly and monthly allowance for food. The budget for food should be in line with greater household budget. A grocery list. Should consist of healthy food options.
Topic	Students in groups of two will be given one of three household budgets (see Addendum #1), which includes; salary, mortgage or rent payments, general living and miscellaneous expenses and will be asked to create a budget for groceries for one month. Each group will receive a different type of household and based on varying circumstances will budget accordingly. They should create a weekly food allowance along with a grocery list that is filled with healthy choices, which include all the food groups while keeping in mind the number of members in the household.
Product/Performance	
Standards	
Other Evidence (general ideas for ongoing assessment, self-assessment)	
Self-assessment	

Exit cards

Check in slips

Pre-assessment

3-2-1

AB partners

Double entry journal

Huh? Aha!

Quick check in Quiz

Teacher feedback

Think Pair Share

Learning Plan (Stage 3) – include ongoing assessment ideas (*separate sheets)

Where are your students headed? Where have they been? How will you make sure the students know where they are going?

Pre-assessment *

Identify the value of each coin

Add and subtract with decimals

List of items and guess the cost

How does one earn money

Multiplication and divide decimals

Calculating percentages

	See Addendum #2
How will you hook students at the beginning of the unit? Entry Point	Use the following video as a lead in to discuss how people make money. Teaching kids about money- where do children think money comes from http://www.youtube.com/watch?v=eGuQlYd6n4
What events will help students experience and explore the big idea and questions in the unit? How will you equip them with needed skills and knowledge? Tiered Activity *	Students will be given activities based on their readiness level that allow them to explore and engage with an authentic task. Please see Addendum #3-will be covered in workshop 5
How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work? Recoding all new information	321 activity: 3 things you learned 2 things you're not clear about 1 way you apply what you have learned AB partners: Turn to a partner and discuss the important elements of creating a budget
How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit?	Students will be given a variety of self-assessments to determine their understanding of the mathematical concepts being taught.

Self-Evaluation *	Jigsaw rubric - http://www.exemplars.com/assets/files/puzzle.pdf see Addendum # 6 Exit cards KUD – See Addendum # 7 Answer Questions – See Addendum #8
How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit? *Differentiate by Learning Profile AND *Differentiate by Interest	In order for students learning to be differentiated by readiness, interest and learning profile they will be given several different choices, which are tailored to their needs. TIC TAC TOE: See Addendum # 4 – as seen in workshop 3 2 – 5 – 8 : See Addendum # 5- as seen in workshop 3
How will you organize and sequence the learning activities to optimize the engagement and achievement of ALL students? Maximize involvement of all students	The unit will begin with an entry point and pre-assessment. The entry point will allow students to develop the knowledge they already have and allow them to engage with the topic. The pre-assessment will allow the teacher to identify the level of the students' knowledge coming into the unit and identify any misconceptions the students have. Following the entry point and pre-assessment, the students will be provided with short, frequent lessons. Students will be asked to recode the new information after each lesson to allow the teacher to ensure that students understand the material. Students will be provided with several opportunities to engage with the material through activities and assessments. Students will be given different options that address their interests, learning profiles and readiness levels. Students will also be provided with an opportunity to conduct a self-evaluation in which they will reflect on what they have learned throughout the unit. The unit will culminate with an authentic task that will provide students with the opportunity to demonstrate their knowledge and skills.

(Adapted from Wiggins & McTighe, 1998)

ADDENDUM #1 : RAFT

You and your partner will create a monthly and weekly food allowance along with a grocery list for one week. It should be filled with healthy choices, which include all the food groups while keeping in mind the number of members in the household you have been given. Happy shopping!

Two income household • Two Adults • Two children	Single income household • One Adult • Two children	Two – income household • Two adults • Two children • One grandparent
Income: \$ 100 000.00 per year Mortgage: \$ 2000.00 per month Saving: \$ 1500.00 per month General Living Expenses & Miscellaneous: \$ 2700.00 per month Groceries per month: _____ Groceries per week: _____	Income: \$ 30 000.00 per year Rent: \$ 750.00 per month Saving: \$ 0 General living expense & Miscellaneous: \$ 1000.00 per month Groceries per month: _____ Groceries per week: _____	Income: \$ 50.000 per year Rent: \$1500.00 per month Saving: \$ 850.00 per month General living expenses and Miscellaneous: \$ 2000.00 per month Groceries per month: _____ Groceries per week: _____

(Completed by Catherine Meloche & Simrin Aulakh in EDPI 654, template adapted from Tomlinson & Moon, 2013)

ADDENDUM # 2 : Pre-assessment

(Completed by Catherine Meloche & Simrin Aulakh in EDPI 654)

1) Identify the value of each coin below:



2) Add the following decimal problems:

$21.34 + 22.56 =$	$138.09 + 2.34 =$	$324.99 + 143.09 =$

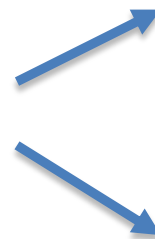
3) Subtract the following decimal problems:

$39.80 - 10.90 =$	$250.50 - 43.45 =$	$130.00 - 114.14 =$

4) From the following list – estimate the cost of each item.

~ ITEMS ~	~ ESTIMATED COST ~
Bananas	
Ipod	
DVD	
Happy Meal at McDonalds	

5) List TWO different ways that you can earn money?



6) Multiply the following decimal problems:

12.20 X 2.31 =	129.86 X 45.99 =

7) Divide the following decimal problems:

$23.41 \div 4.80$	$531.97 \div 32.45$
-------------------	---------------------

8) Calculate the following percentage problem:

25% of 100	50% of 200	45% of 235
------------	------------	------------

ADDENDUM # 6 : JIGSAW RUBRIC Completed by Catherine Meloche and Simrin Aulakh in EDPI 654 , Retrieved from:
<http://www.exemplars.com/assets/files/puzzle.pdf>

LEVEL	PROBLEM SOLVING	REASONING & PROOF	COMMUNICATION	CONNECTIONS	REPRESENTATION
NOVICE Makes an effort No or little understanding	I did not understand the problem.	My math is not correct.	I used no math language and/or math notation.	I did not notice anything about the problem or numbers in my work	I did not use a math representation to help solve the problem and explain my work.
APPRENTICE Okay, good try Unclear if students understand	I only understand part of the problem. My strategy works for part of the problem.	Some of my math thinking is correct.	I used some math language and/or math notation.	I tried to notice something, but it is not about the math in the problem.	I tried to use a math representation to help solve the problem and explain my work but it has mistaken in it.
PRACTITIONER Excellent Clear Strong Understanding Meets the Standards	I understand the problem and my strategy works. My answer is correct	All of my math thinking is correct.	I used math language and/or math notation accurately throughout my work.	I noticed something about my work.	I made a math representation to help solve the problem and explain my work and it is labeled and correct.
EXPERT Wow, awesome! Exceptional Understanding	I understand the problem. My answer is correct. I used a rule, and/or verified that my strategy is correct.	I showed that I knew more about the math idea that I used in my plan. Or, I explained my rule.	I used a lot of specific math language and/or notation accurately throughout my work.	I noticed something in my work, and used that to extend my answer and/or I showed how this problem is like another problem.	I used another math representation to help solve the problem and explain my work in another way.

ADDENDUM # 7 : KUD

Completed by Catherine Meloche and Simrin Aulakh in EDPI 654

KNOW : The rules for adding, subtracting, multiplying and dividing decimals.

UNDERSTAND: Describe the steps in creating a budget.

BE ABLE TO DO (SKILLS): Provide and solve a money problem for each computation (+, -, x, ÷) involving decimals.

ADDENDUM # 8 : ONGOING ASSESSMENT

Completed by Catherine Meloche and Simrin Aulakh in EDPI 654

$21.34 + 22.45 =$	3 apples cost \$5.15 . How much does one cost?	$235.88 - 21.34 =$
$450.00 + 56.78 =$	There is a discount of 35%. The item originally cost \$55.34. How much does it cost after the discount?	$65.99 - 64.23 =$
$45.67 - 2.35 =$	$3 \times 334.99 =$	$12.25 \times 4.50 =$

Here is a blank template for you to create an Understanding by Design unit plan during our workshop.

Title of Unit		Grade Level	
Curriculum Area		Time Frame	
Developed By			
Identify Desired Results (Stage 1)			
Competencies			
Understandings		Essential Questions	
Overarching Understanding		Overarching	
Students will understand that.... (3-5 understandings)		Understandings turned into key questions	
Related Misconceptions			

Knowledge Students will know...		Skills Students will be able to...	
Assessment Evidence (Stage 2)			
Performance Task Description (separate sheets)			
Goal/Role			
Role/Audience			
Audience/Format			
Situation/Topic			
Product/Performance			
Standards			

Other Evidence (general ideas for ongoing assessment, self-assessment)	
Learning Plan (Stage 3) – include ongoing assessment ideas (*separate sheets)	
Where are your students headed? Where have they been? How will you make sure the students know where they are going? Pre-assessment *	
How will you hook students at the beginning of the unit? Entry Point	

What events will help students experience and explore the big idea and questions in the unit? How will you equip them with needed skills and knowledge? Tiered Activity *	
How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work? Recoding all new information	
How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit? Self-Evaluation *	
How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit? *Differentiate by Learning Profile AND *Differentiate by Interest	

How will you **organize** and sequence the learning activities to optimize the engagement and achievement of ALL students?

Maximize involvement of all students

(Adapted from Wiggins & McTighe, 1998)

Workshop 5

Tiered Activities & Scaffolding

Workshop Activity

Scaffolding KWL

What I know about Scaffolding K	What I want to know about Scaffolding W	What I learned about Scaffolding L

(Adapted from Tomlinson & Moon, 2013)

RESEARCH-BASED SCAFFOLDING STRATEGIES

Modelling: (Bliss, Askew, & Macrae, 2006) Teacher serves as a role model and demonstrates how to use specific skills and how to think critically. Student or students observe the teacher as they walk through a challenging problem or task. They watch as the teacher takes them through each step of the problem-solving process. When modelling, it is important to verbalize every step of the process. Tell your students what you are thinking, what you are doing, and why. For many students it is extremely helpful, as it aids in structuring their thinking for problem solving. You are taking them through the process in an aim to have them imitate how you go through the process. After you have modelled a particular task or problem, the student will attempt independently, or with support. Modelling can also be conducted using a more expert student as the model. It may be helpful to have some of your students think-aloud as they attempt the task.

Feedback: (Sanders & Welk, 2005) Feedback is an essential strategy in a Differentiated Instruction classroom. Feedback should allow the student to compare their work to a standard. You must tell students before they begin what you expect. The expectations can be presented in several ways. You may want to show them an example from a previous student. This might be particularly useful for science projects or for assignments that require students to build a model. Students benefit from seeing an example of what you are expecting from them. You may want provide your students with a checklist that indicates all the elements of the task. Checklists helps students ensure they include the necessary elements of a piece of writing, a project etc. The checklist can help to alleviate some of your check-ins, allowing the students to develop more independence and you to focus on the students who need more support on a given task. Rubrics are a great way to communicate your expectations to your students. It is important to provide the rubric when the assignment or task is presented. Feedback must be very specific and should refer students back to the example, checklist or rubric you provided. This will allow student to find their mistakes and make adjustments in their work. Feedback such as “great work or super” does not give the student feedback on what they did well. Feedback should be given often! You can provide feedback in oral or written form.

Instructing: (Bliss, Askew, & Macrae, 2006) Instructing is when teachers provide their students with foundational knowledge. Instructing should be used for teacher directed activities. When instructing you will tell your students what they should do, how to do it, and why they should be doing it. This strategy should be used when you need to support students to develop the skills they need in order to carry out a specific procedure or task. The goal of instructing is to help students develop metacognitive skills. When your students are able to carry out the task or procedure independently, they should be able to use your instruction as a guide. The words that you use should be same each time you work on a similar task, this will allow the student to internalize the steps and eventually be able to work through the process independently. For students some students, it may be beneficial to have your directions written down on cue cards so that they can refer to them when needed rather than having to retrieve them from memory.

Questioning:(Roehler & Cantlon, 1997) Questioning is a great scaffolding strategy that allows teachers to guide their students through a process or a concept by asking questions that will enable their students to search for the answers or resources need to complete the task. By using this scaffolding strategy, you are asking students to take you through the process. This places the ownership of learning on the student. For example, imagine that you are working with a student who is struggling with a word problem in Mathematics. Instead of telling the student what the steps are or identifying the important information needed to solve the problem, you might ask some of the following questions “What do you know? What facts can you find that will help you to solve the problem? What is the question asking you solve? What concepts or operations do you think you will need to use?” This allows the student to verbalize and think aloud as they work through the problem. Another example of questioning could be questioning the student as they try to identify the author’s message or purpose when writing a response in Language Arts. In this case you might as the student “Authors have a purpose and a message to convey when they write. Why do you think the author wrote this story? What do you think the author is trying to say? Why do you think the author chose to tell you this?” Although the two examples in this manual are using mathematical problem-solving and Language Arts, this strategy can be used for any subject matter. It is helpful to use the same questions each time you work on a similar task, this will allow the student to internalize your questions and eventually be able to work through the process independently. For students some students, it may be beneficial to have your questions written down on cue cards so that they can refer to them when needed rather than having to retrieve them from memory.

Cognitive Structuring:(Bliss, Askew, & Macrae, 2006) Cognitive structuring teaches students how to organise information for future use. When you use this strategy your aim is to help your students develop metacognitive skills. You will teach your students how to use tools such as concept maps, graphic organisers, and strategies for memorisation (mnemonics, acronyms, repetition, etc.). It is important to show your students a variety of tools and how they can be applied to different subject matters. For example, you might teach your student how to fill a timeline for history or you might teach your students how to use flash cards to memorise their multiplication facts. You should provide many opportunities to students to have guided practice with the different tools. You can build a bank of these resources for each of your students as you teach the use of each tool. This will allow each of your students to have access to them when they are working independently.

On the next page you will find a tiered activity. The activity was tiered using Bloom’s Taxonomy.

ADDENDUM # 3 : Tiered Unit – Find or Create a Recipe

Completed by Catherine Meloche & Simrin Aulakh in EDPI 654

Find or create a recipe. Estimate a budget.

(X – 1) & (X – 2) on following pages



X + 2 – EVALUATION for your favorite meal.
Use several different grocery store flyers to find the most cost effective prices for each item and determine whether you were able to stick to your estimated budget. Explain whether your budget was realistic, why or why not?

X + 1 - ANALYSIS



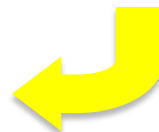
Find or create a recipe and figure out what items you need to purchase. Choose two grocery stores and create an itemized list for each item and determine which grocery

X – APPLICATION

Find a recipe and figure out what items you need to purchase. Look through the flyers provided and determine the cost of each item. How much would it cost to make your favorite meal including taxes?

X – 1 – COMPREHENSION

With recipe given and costs provided, calculate the cost of your meal including taxes.



X – 2 – REMEMBER



From a grocery flyer provide student with a problem that deals with adding, subtracting, multiplication of decimals along with problems that include tax.

X – 1

RECIPE: Chicken Stir Fry

Find the cost of the following recipe: (taxes are already included for each item)

boneless, skinless chicken breast	\$7.99
Garlic	\$0.79
Onion	\$3.00
Broccoli	\$ 1.99
Bell Peppers	\$ 3.49
Carrots	\$ 2.99
Ginger	\$ 0.99
Noodles	\$ 2.00
FOR TERIYAKI SAUCE:	
Vegetable oil	\$5.99
Soy Sauce	\$2.50
Ketchup	\$4.99
Vinegar	\$4.49
Pepper	\$1.99

X - 2

You want to make breakfast and need eggs and bread. At IGA, this week, eggs cost \$3.99 and bread costs \$3.49. How much will it cost to make breakfast?



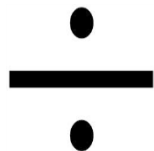
I have \$15.25 to buy snacks. I want to buy kettle chips for \$2.50, yogurt for \$4.48, and granola bars for \$5.97. How much money will I have left over after I buy my snacks?



Ms. Simrin and Ms. Catherine want to buy cupcakes for their classroom. There are 21 students in the grade 6 class and each cupcake cost \$2.25. How much do your teachers have to spend to get every student a cupcake?



A box of 8 Danone yogurts cost \$7.00. How much would it cost for each yogurt?



Workshop 6

Learning Environment and Understanding the Brain

Use this space to draw out the physical set up of your classroom!

Instructional Strategies for Classroom Management

Sponge Activities: (Chapman & King, 2008) A sponge activity is an instructional strategy that helps teachers manage DI in the classroom. This strategy is used to replace what might often be wasted time, such as when a student has finished his or her work early, a transition period, or during an interruption. This strategy might also be used when you have to spend more time providing instruction to a small group. This will allow your other students to have a productive task to complete. This strategy can help students to be more independent. Sponge activities can be planned into your lesson. You may want to build in blocks that allow students to have purposeful movement, allow for relaxation, listening, following directions and turn taking. You may want to post in your classroom the list of sponge activities for the week. This will allow students to know what is expected if they are asked to work on a sponge activity. Sponge activities connect to student interest.

Here are some examples of sponge activities:

Simon Says, Yoga, work on independent study projects, play a math game with a peer, play scrabble, revising portfolios etc.

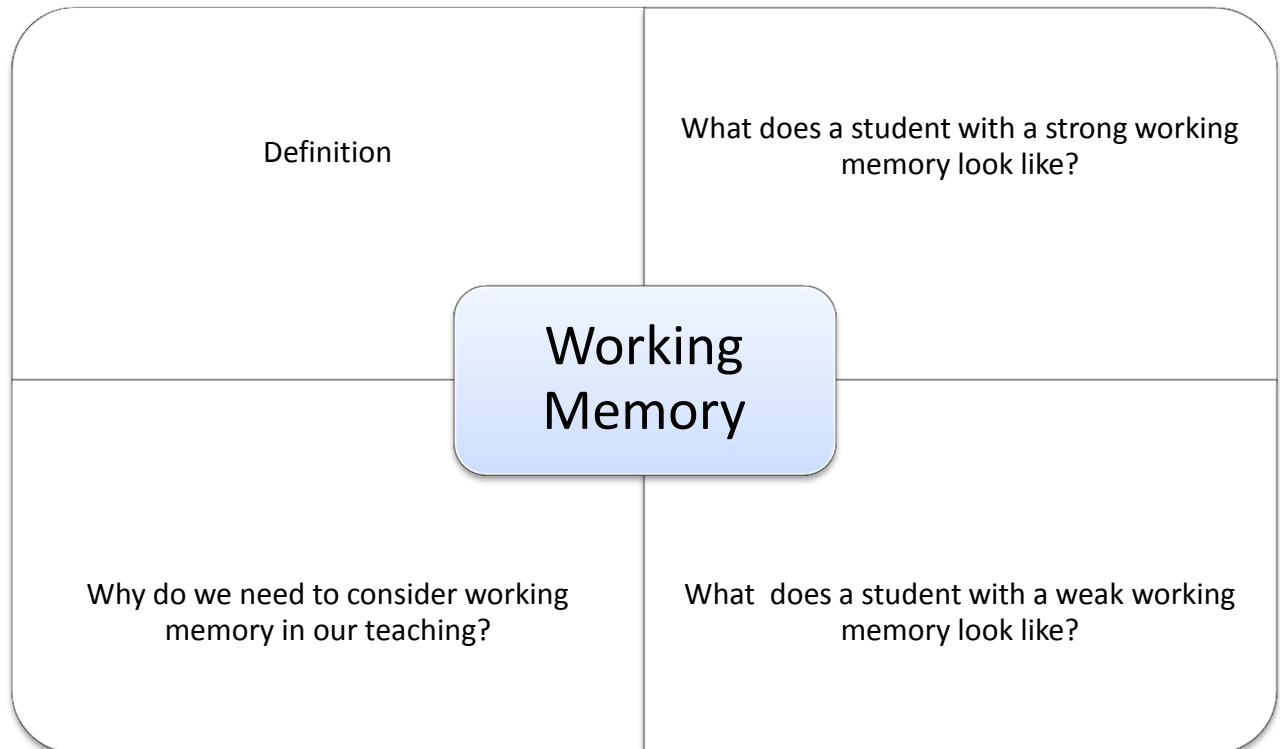
Cubing: (Chapman & King, 2008) Cubing is another instructional strategy that helps teachers manage the DI classroom. It is used to challenge students while also providing them with a variety of options. Teachers use the net of the cube to outline 6 activities that correspond to the unit skills and have a range of thinking levels based on Bloom's taxonomy. Once the teacher has outlined the activities on each face of the net, create a cube! Students then roll the cube and do the activity that is rolled to the top, students have a chance to roll a second time if the first activity does not trigger their interest. This activity can be done individually, in groups, or in partners. It's a great way to develop critical-thinking skills while engaging students. The students will never know what activity they will get and you've provided opportunities for movement as well as visual cues for the different types of learners in the class.

The different faces of your cube should have varying higher-thinking skills:

Describe it (knowledge)	Explain it (comprehension)	Develop (application)
Classify (analysis)	Create (synthesis)	Opinion (Evaluation)

Workshop Activity

Frayer Diagram



Workshop Activity

3-2-1

Identify 3 facts you learned about the brain today

Identify 2 ways this information will help you in your classroom.....

Identify 1 question about the brain you still have.....

(Adapted from Tomlinson & Moon, 2013)

Workshop Activity

Journal Entry

As this our last workshop we would like you to take the opportunity to reflect on our time together.

In what ways did this workshop series change your teaching?

If you have implemented any of the strategies from this workshop, have you noticed any changes in your students? Explain.

Has this workshop helped you feel more comfortable implementing a DI approach?

We welcome your feedback on how to improve this workshop series for future teachers!



The DI Approach: Pathways to Student Success

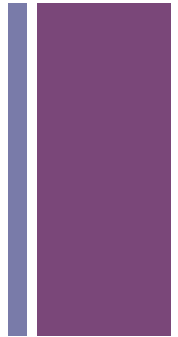


An Overview of Differentiated Instruction (DI)

Simrin Aulakh & Catherine Meloche

+ Introduction to the Workshop Series

- All references can be found in the accompanying literature review.
- Any citations that were not used in the literature review will be referenced at the end of each workshop
- You can use these slides in conjunction with the manual and literature review to gain a deeper understanding of differentiation.
- The manual is broken down into six sections, that reflect the slides in the workshops.



+ Who we are?

- Simrin is a teacher
- Catherine is a remedial specialist
- We both graduated from University, thinking we were ready to meet the needs of today's students
- Little did we know, the classroom was more diverse than we could have imagined
- Left with many unanswered questions we headed for a Master's in Education to fill our gaps in knowledge
- We were given the opportunity to explore in depth the DI approach
- This provided us with a valuable opportunity that we hope to share with our fellow colleagues



+ Do Teachers Understand DI?

- 75% of teachers were lacking knowledge with DI (Dee, 2010)
- Teachers feel inadequate (Dixon et al., 2014)
- Teachers have not been exposed to differentiation
- 10 or more hours of experience with a strategy or exposure in a workshop leads to more effective implementation



+ Goals of this Workshop Series

- To provide an overview of the DI approach
- To practice DI both in our workshops and in the classroom
- To address some of the barriers and issues that have been identified by the research
- To calm your fears and insecurities
- To de-mystify common misconceptions
- To help teachers to develop a more positive attitude and confidence in their abilities to reach every student
- **STUDENT SUCCESS!!!!**



+ What we are doing today?

- Difference between what DI is and isn't
- Theory behind DI
- Brief overview of DI
 - Elements of DI and Assessment
- Effectiveness of DI
- Barriers to DI

Throughout this workshop we will be participating in activities that you can use in your classroom!



+ Let's take a Look...





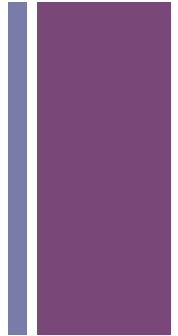
What does DI mean to you?

Answer the following questions using the cards found in your package

Green for YES

Red for NO

- Do you feel you use a differentiated approach in the classroom?
- Do you tailor lessons for high ability?
- Do you tailor lessons for average ability?
- Do you tailor lessons for low ability?
- Do you tailor lessons by interest?
- Do you consider learning styles when planning?
- Have you heard of Understanding by Design?
- Have you heard of tiered lessons?
- Have you practiced scaffolding strategies?
- Have you ever used exit slips, Frayer diagrams, 3-2-1 activities , 2-5-8 or tic tac toes in the classroom?
- Have you used flexible grouping?



+ Getting Rid of those Misconceptions!!

- Differentiation is NOT simply
 - Just providing varied worksheets
 - Allowing for more time
 - Reducing or increasing number of tasks
 - Working in a group or with a partner
 - Curriculum coverage
 - Use of manipulatives
 - Reactionary
 - Individualization

• Good teaching practice exposes misconceptions, not hide them.

<http://mathsteaching.com>



+ Here's What you Need to Know!

■ Differentiation

- Is a responsive method to teaching
- Is meant to target all needs
- Is dynamic
- Considers readiness, interest, and learning profiles
- Challenges every student
- Fosters autonomy and self-regulation
- Focuses on mastery of skills
- Is a proactive approach
- Is thoughtful planning



Tomlinson, 2003

DI is Grounded in Theory

- Vygotsky (1978) sociocultural theory is the basis for social constructivism
- It is part of a DI approach, it includes:

Social interaction

Student-teacher
relationship

Scaffolding



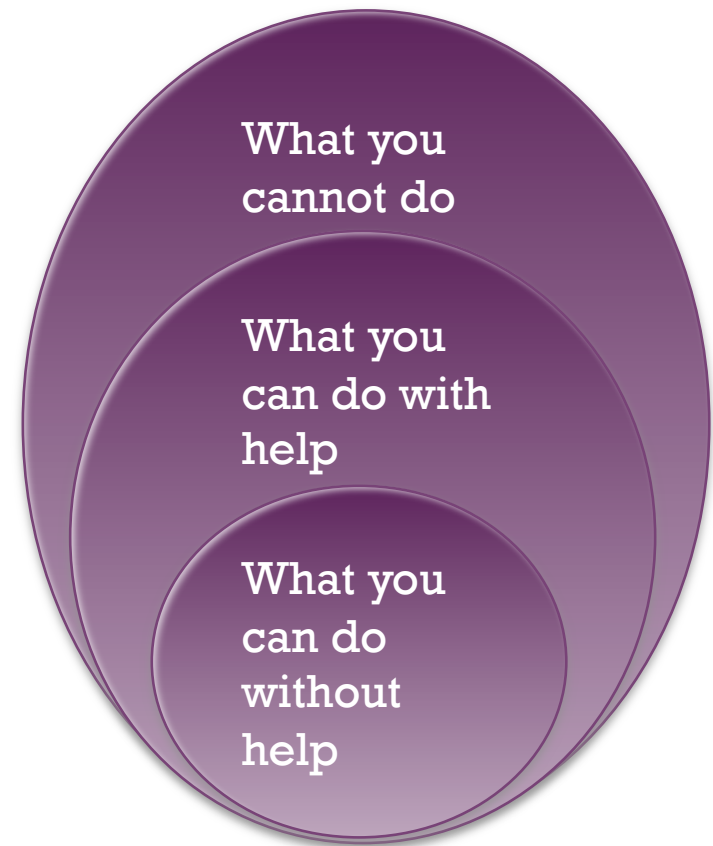
These lead to
internalization of
knowledge, long
lasting learning, and
makes learning
more meaningful

Lev Vygotsky



+ A Little More Theory...

- Vygotsky (1978) also introduced the concept of the Zone of Proximal Development (ZPD), which is defined as the “distance between actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 33).
- It is a developmental process
- Students can only move from one level to another with help from an adult or a more expert peer



**TEACHERS CAN
DIFFERENTIATE**

CONTENT

PROCESS

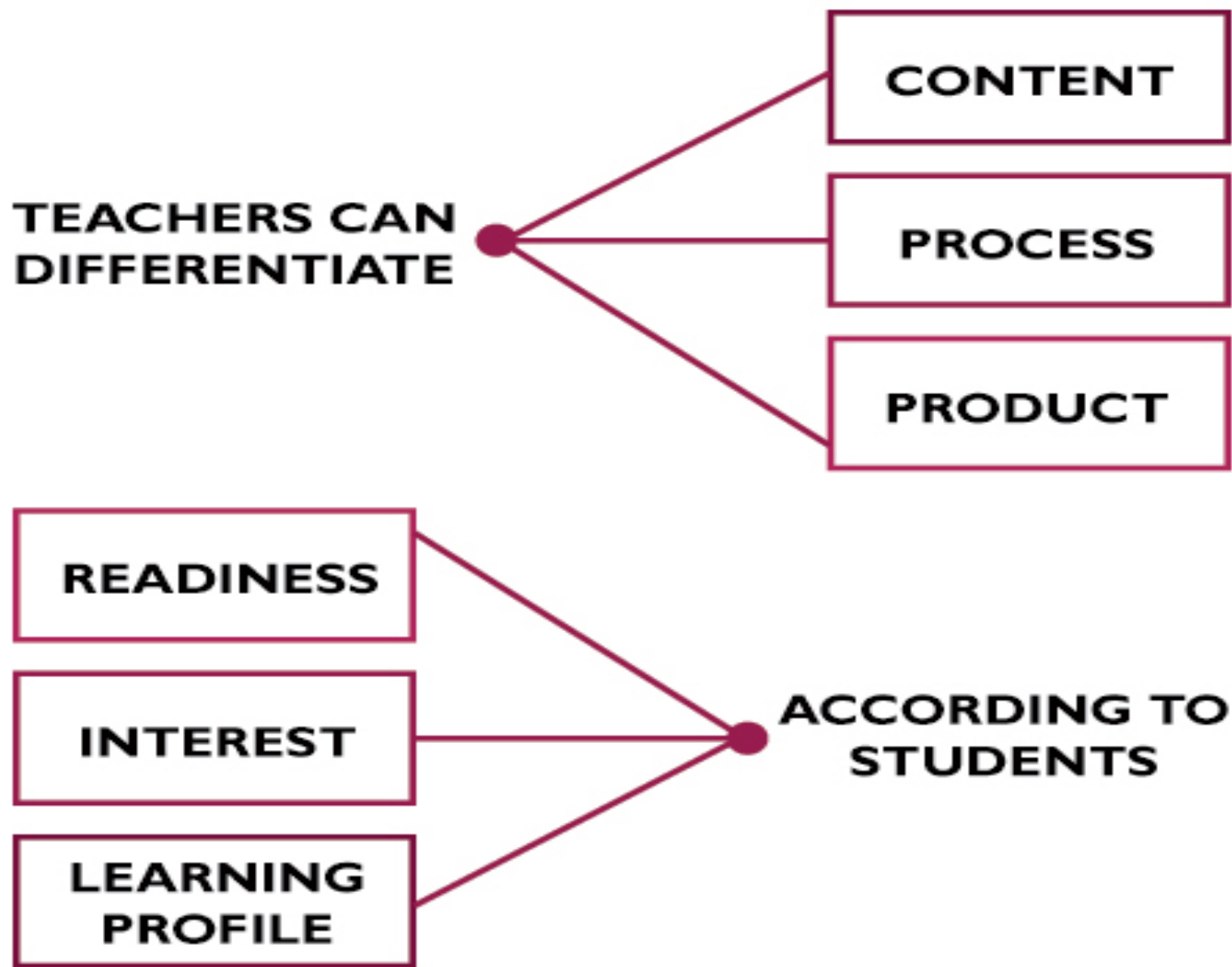
PRODUCT

READINESS

INTEREST

**LEARNING
PROFILE**

**ACCORDING TO
STUDENTS**



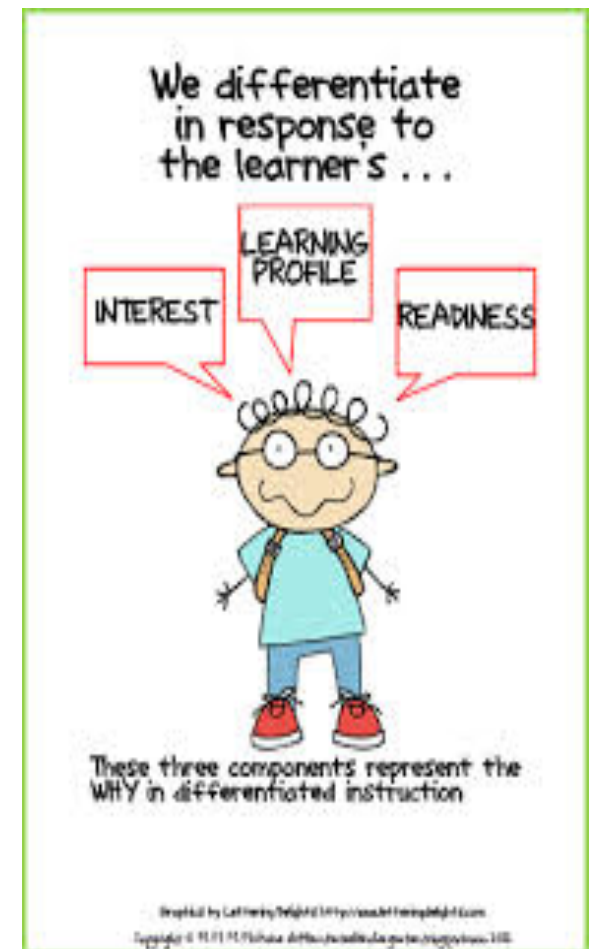
+ Breaking it down

- Process refers to the learning experiences in the classroom
 - When students work with and manipulate essential knowledge that relate to the skills in the unit
 - Construct their own meaning
- Content is what teachers teach
 - Materials used
 - In line with cognitive ability
- Product refers to the result of a unit
 - Evidence of skills used by a student
 - Holds student accountable
 - Varied formats

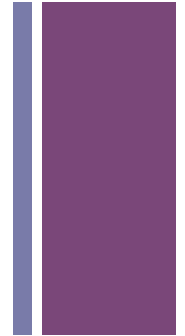


+ Breaking it Down cont'd.

- Readiness is how ready a student is to learn and their “proximity to specified learning goals” (Tomlinson & Moon, 2013, p. 10).
 - Readiness is flexible
 - Readiness is based on prior knowledge and experiences
- Interest refers to tasks or subjects that spark a level of excitement and motivation to learn
 - Teachers can build on current interests and foster new areas of interest
 - Linked to motivation
- Learning profile refers to the way that an individual attends to, processes, internalizes, and retains new information.
 - Students’ preferred method of learning
 - Made up of several different variables



+ Pre-Assessment



Pre-
Assessment



- Pre-assessments help teachers to identify a student's readiness level, interest, and learning profile
- Identify misconceptions and gaps in knowledge
- Only for gathering information, NOT for grading
- Discussion Period
 - What misconception were eliminated today?
 - Have you ever used a pre-assessment?
 - If yes, what did you do and how did it help?

+ Formative Assessments

- Evaluate their teaching and its impact on students
- Assessments for learning
- Both formal and informal assessments
- Formative assessments should be combined with effective feedback



+ Summative Assessments

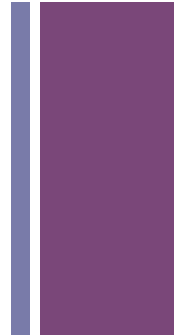
- Assessments are more formal
- Should be authentic
- Evaluate at the end of an instructional unit
- Varied formats



The end results of a summative assessments should demonstrate a teacher's instructional effectiveness, a student's mastery and gaps in knowledge (Tomlinson & Moon, 2013).

+ “STOP...COLLABORATE...AND LISTEN”

- Vanilla Ice



Scenarios – Is it or isn't it DI?

Let's Discuss

- “I differentiate because every week my IEP students choose only 5 words to study out the regular 10 words. I give them choice and I'm reducing the demands.”
- “I provide my students with manipulatives, visual aids, and opportunities for movement which considers their learning profiles.”
- “I differentiate because I administer pre-assessments and carefully plan my lessons to accommodate the needs of all my students”
- “I have a really gifted boy in my class and always am sure to give him extra pages of the concept and skill we are working on.”

**Just remember
to...**

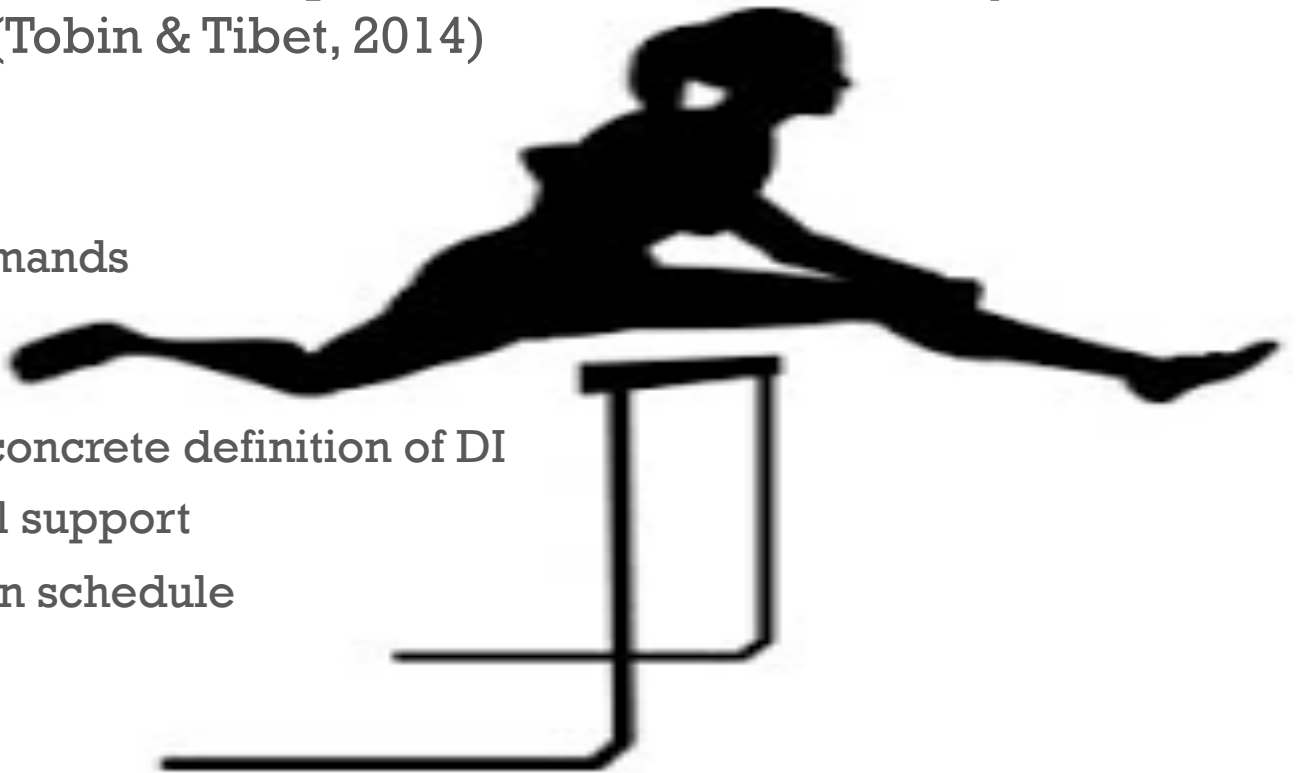
Why should you adopt DI approach?

- A Quebec study found that
 - strong leadership, collaboration and support services are positively linked to adaptations and academic progress monitoring (Roy et al., 2013).
 - Teachers who apply DI promote more student autonomy
- Ernest et al. (2011) applied DI strategies
 - Average went from 49% to 80%
 - Students' success validated extra planning time for teachers
- Pai et al. (2015)
 - Small and flexible grouping led to better transfer skills



+ There are some hurdles

- Teachers fear and insecurities prevent them from effectively implementing DI (Tobin & Tibet, 2014)
 - Issues of time
 - Coverage
 - Assessment demands
- Tomlinson (1995)
 - Teachers need a concrete definition of DI
 - Need professional support
 - Not enough time in schedule



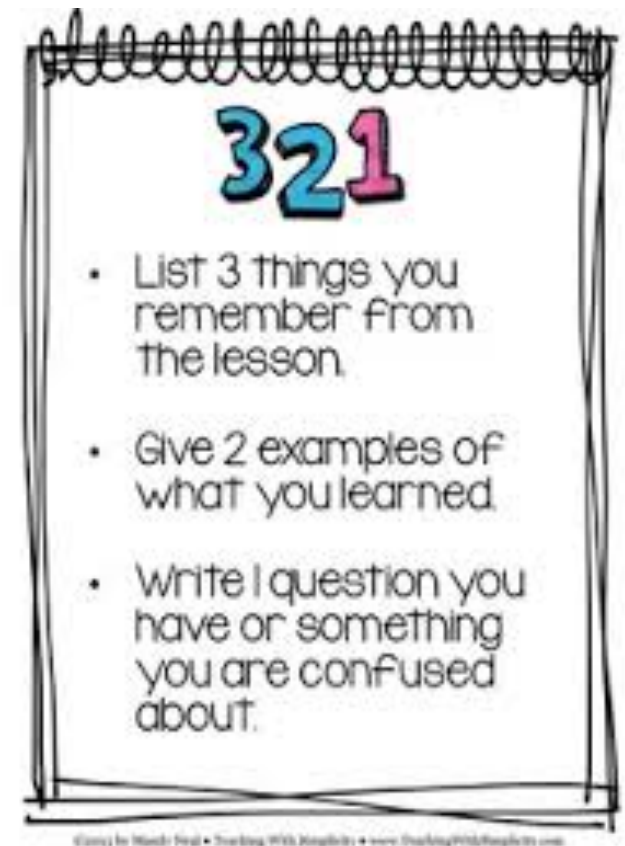
+ Differentiation: Mission Impossible?

- Discussion Period
 - Now that we've thrown a whole bunch of information at you, how do you feel?
- A full DI approach is not going to be implemented overnight or even in the next few months
- It needs to be implemented one strategy at a time
- Start off small and be consistent
- As we move along you will begin to introduce new strategies
- We are surrounded by professionals and will help guide each other through the ups and downs during this process



+ 3-2-1 Activity

- This activity is an example of the formative assessment that you could implement in the classroom.
 - This is a little glimpse into what we will be discussing in our next session on assessment
 - On the sheet provided write
 - 3 facts or idea you learned today
 - 2 facts or ideas you are not clear about
 - 1 way you might apply what you have learned
- Tomlinson & Moon, 2013



Until next time....





The DI Approach: Pathways to Student Success



Assessment and DI

Simrin Aulakh & Catherine Meloche

+ What are we doing today

- KUDs
- Pre-Assessments
- Formative Assessments
- Effective Feedback
- Summative Assessments

Throughout this workshop we will be participating in activities that you can use in your classroom!



+ Review from Last Time

■ Activity

- What do you know about assessment?

Hold up your True and False cards to answer the following questions:

- ❖ There are two categories of assessment ?
- ❖ Pre-assessments eliminate misconceptions ?
- ❖ Formative and summative assessments are the same ?
- ❖ All assessments are used for grading ?
- ❖ Assessments show teacher efficacy ?
- ❖ Assessments only provide a measure of outcomes ?
- ❖ Pre-assessments take too much time ?

This activity is an example of a response card assessment

+ KUDs

- KUDs is critical vocabulary for a DI teacher. It will become the basis for all the elements of a DI lesson (Tomlinson & Moon, 2013)
- You shouldn't go on a journey without a destination. In order to create any assessment you must consider the KUDs.

KUD Template

Know:

K refers to knowledge

Understand:

■ U refers to understanding of the unit

Do:

■ D refers to Do – what skills will a student need for success

+ What do this Mean?

K for Know

■ **Declarative Knowledge**

- English
 - Elements of story
 - Critical vocabulary
 - Grammar rules

■ D for Do

- Focus on transfer of skill

■ English

- Explain the elements of a story
- Analyse how elements of story contribute to our understanding
- Write a response to literature with evidence to back up your statements

■ U is for Understanding

What you want students to remember over time

- Most important part of the unit

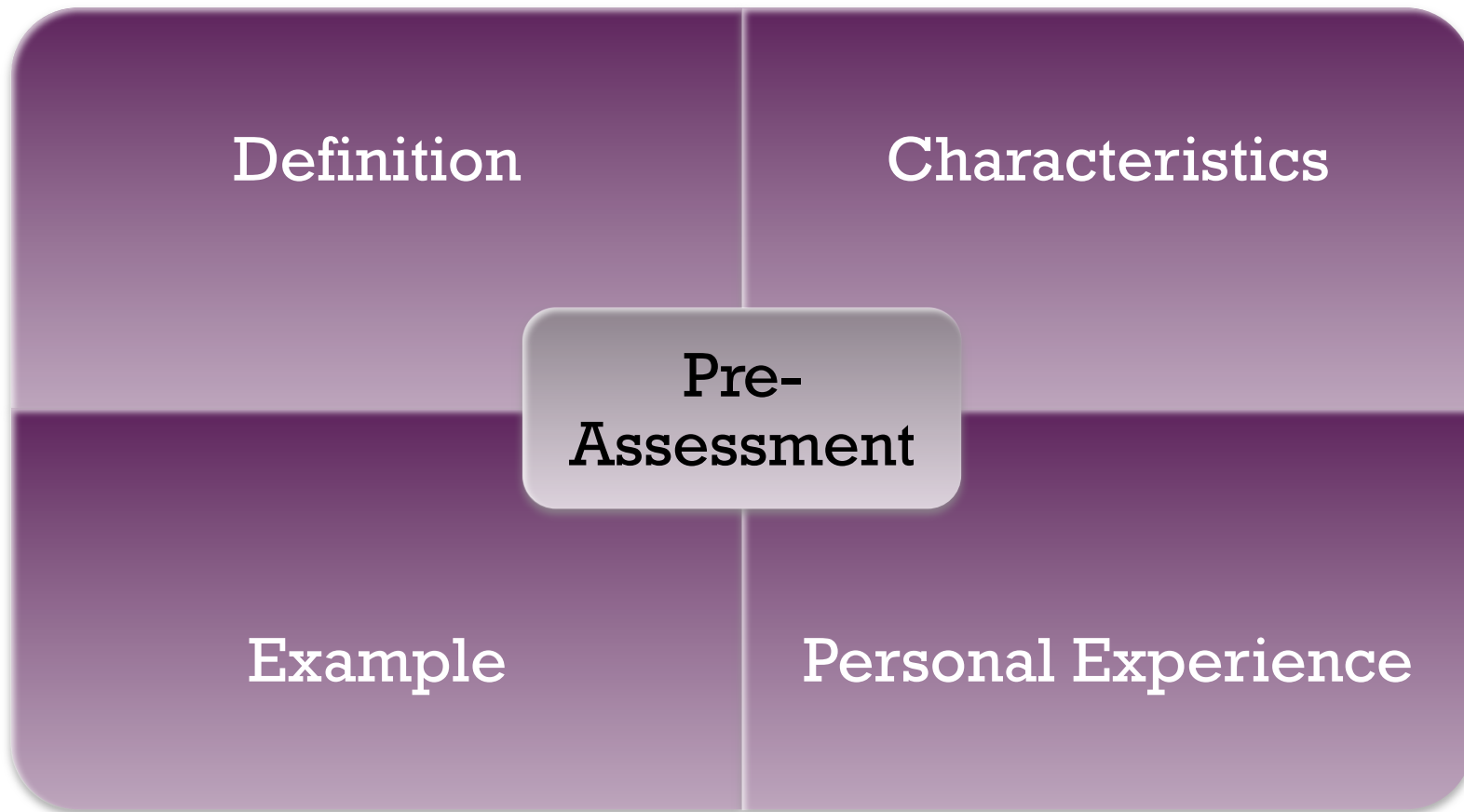
■ English

- How do elements of a story connect to each other?
- In what ways does literature affect life?
- How do we use lessons learned from literature?
- How does grammar connect to communication?

+ Examples of KUDs

Know	Understand	Do
The rules of different types of poetry.	Poems are used to convey feeling, thoughts, ideas, and observations.	Will be able to apply and create different types of poems which the proper literary structure.
-The rules of simplifying fractions -Multiples -Divisibility rules	That fractions are part of whole. That the same part of a whole can be represented by several different fractions.	Will be able use division to simplify fractions.

+ What do you know about Pre-Assessments?



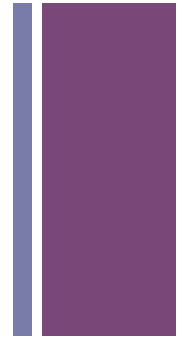
Fill in the Frayer diagram provided in your manual!

+ What are Pre-Assessments

***“Assessment is today's means of modifying tomorrow's instruction.”
Carol Ann Tomlinson***

- ❖ Before you start teaching a new concept, it's important to know what knowledge your students have or are lacking
 - ❖ Some students could have a good prior knowledge skills while others have a limited understanding
- ❖ Often teachers only assess at the end of a unit to determine mastery level
 - ❖ Assessing throughout a unit can help teachers to catch students who aren't quite getting the material or who have exceeded expectations
 - ❖ Pre-assessments allow teachers to adapt their teaching so that EVERY student is being challenged

+ Dual Faceted



PURPOSE ONE

- Identify misconceptions
- Find gaps in learning keeping in mind their ZPD
- Corrects misconceptions

It is important for teachers to reverse misconceptions before moving on to a new concept

PURPOSE TWO

- Identify student's level of mastery of the skills needed for the unit
- Helps teachers eliminate wasted time teaching what students already know



Tomlinson, 2003;
Tomlinson & Moon, 2013

+ Identify the Misconception

$$\begin{array}{r} 3.25 \\ + 4 \\ \hline 3.29 \end{array}$$

$$\begin{array}{r} 25.45 \\ + 23.9 \\ \hline 2776 \end{array}$$

What misconception does this student have about adding with decimals?

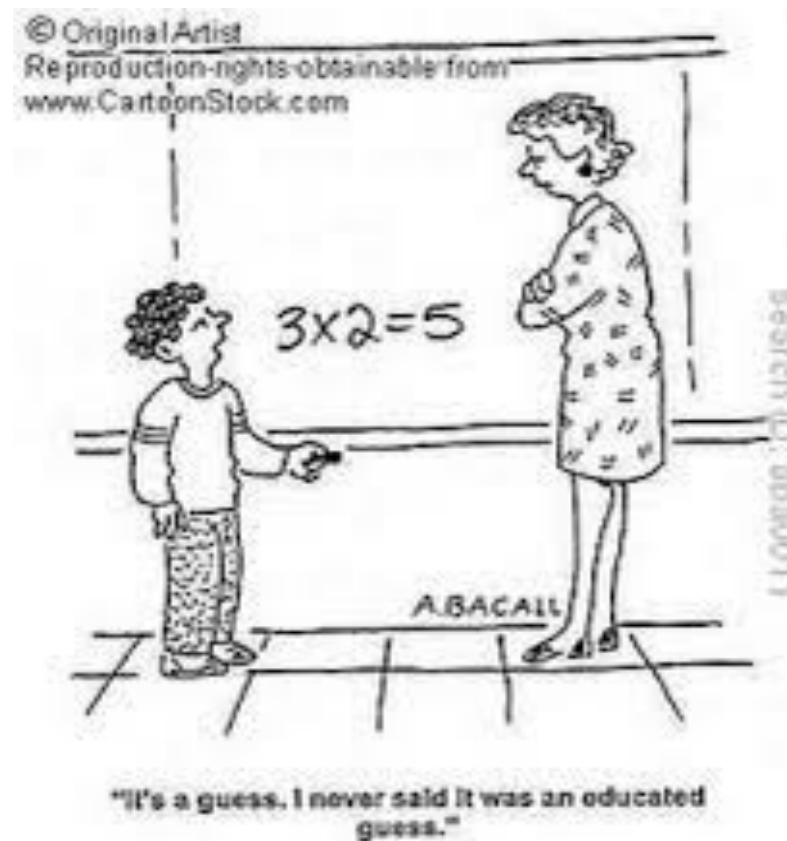
+ Practice Makes Permanent

- You are teaching Grade 6 and are starting a unit on money. You realize after your evaluation that students are still struggling with addition using decimals
- A pre-assessment would have allowed you to reinforce these concepts from the beginning
- Rather than making the assumption that everyone knew how to add decimals you would have been able to hone in on the struggling students



+ Identify the misconception

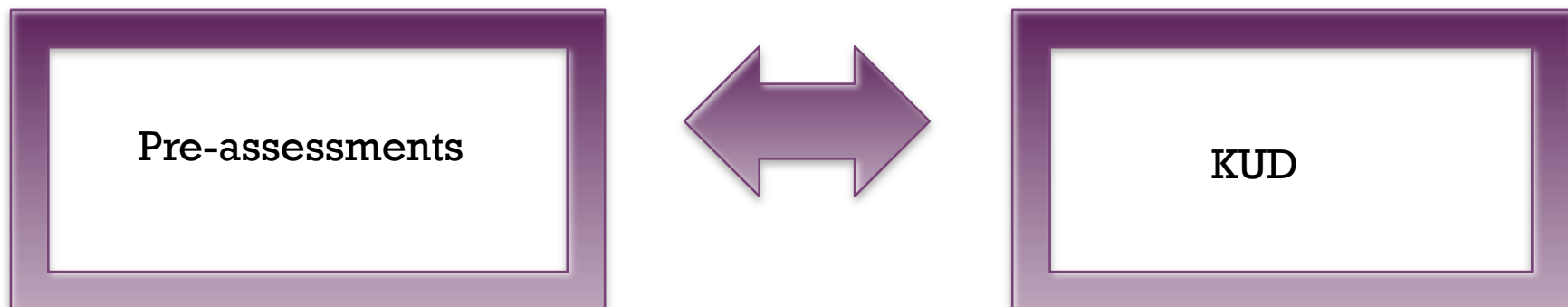
It is easier to correct the misconception from the beginning rather than after it is embedded into their skills



+ How to Create an Effective Pre-Assessment

- Pre-assessments have to be in line with the KUDs
- Data collection is appropriate for teacher and fits both the needs and goals of the unit
- Pre-assessments should be short
- Pre-assessments should be easy for the teachers to determine if students are in line with the KUDs
- Pre-assessment is not for grading

Tomlinson & Moon, 2013



+ Examples of Pre-Assessments

■ Informal

- Hand Signals
- Response cards
- KWL
- Conversations and observations
- Squaring Off

■ Formal

- Frayer Diagram
- Systematic observation and interviews
- Writing prompts
- Quizzes
- Surveys

The manual has more detailed explanations of each pre-assessment.



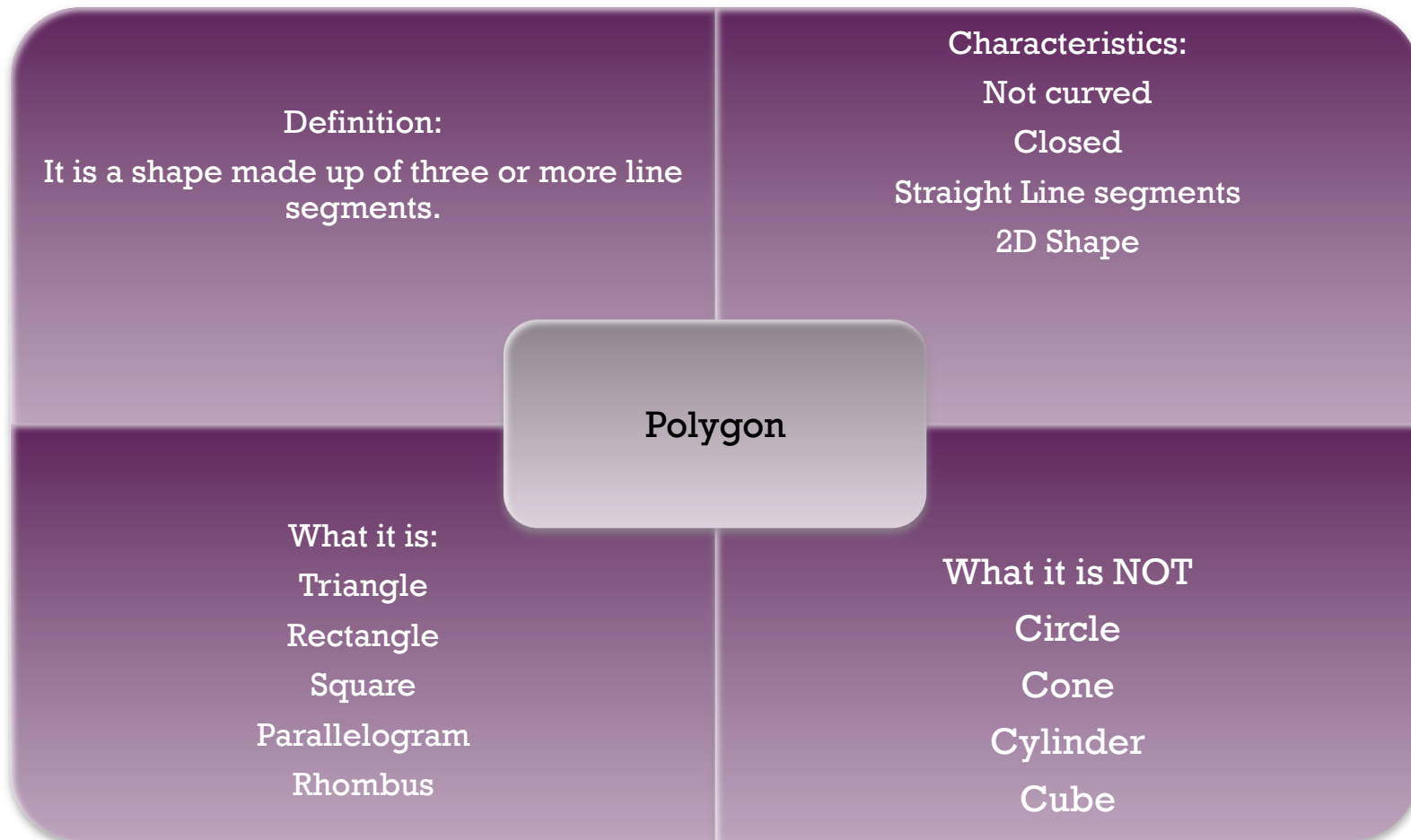
+ KWL

You are reading a class novel called, “Wonder” and are discussing character development. You want to gain an understanding of what your students know about the main character, Auggie. This assessment is to be done in two segments, once before the lesson and once after. Before the lesson ask students to fill in what they know about the character from previous readings and what they want to know about the character. After reading and completing your lesson ask the students what new traits they have learned about the character.

What I Know	Auggie is a boy who has a facial deformity. He has never been to regular school. Auggie is entering school for the first time in grade 7.
What I want to know	What is his experience going to be like? Will the students accept him? Will it be hard for him to adjust to being in a classroom?
What I've learned	He makes some friends but is isolated from most of his peers. He perseveres and learns to stand up for himself.

+ Frayer Diagram – Math

This is an example of a Frayer Diagram to pre-assess student's knowledge of polygons



Adapted from Tomlinson & Moon, 2013

+ Formative Assessments

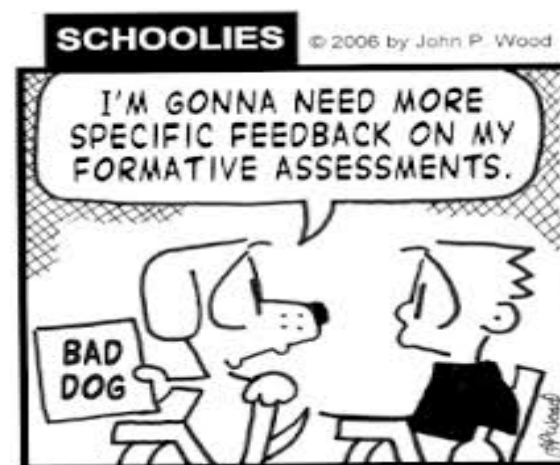
- Similar to pre-assessments because they are used as a guide to instruction
- They are a method for teachers to reflect on teaching practices, track individual progress, and foster metacognitive skills
- Sometimes used for grading unlike pre-assessments
- Without ongoing assessments teachers are working under the impression that all students are on track with their learning



+ Formative Assessments are not Enough

- It is not enough to just administer formative assessments
- Students need feedback
- Effective feedback
 - Teachers need to clearly communicate with students
 - Should build trust
 - Should be easy to understand and be specific
 - Targeted toward KUDs
 - Provides students with clear instruction that are in line with their readiness levels
 - Leads to self-regulated learning

Brookhart et al., 2010; Hattie & Timperley, 2007; Tomlinson & Moon, 2013



"Asking students to think about their work before receiving feedback scratches up the 'soil' in the brain so the feedback seeds have a place to settle in and grow."

—Jan Chappell, "How Am I Doing?,"
Educational Leadership, September 2012



+ Some Questions

- How many of you use good job, super job, great work, or variations of this to provide positive feedback to your students?
- Is this an example of effective feedback ?
- Why not?

Remember that feedback needs to be specific, clear, and individualized for students to benefit.



+ Effective Feedback

■ English

- I like the way you use your fingers to track your reading. This helps you to not skip over the words.
- I can tell you really worked hard to sound out your words. A great way to improve your spelling is to use your personal dictionary or the word wall.
- I like the way you provided an example to show how the author used descriptive language.

■ Math

- I like how you lined up your ones, tens, and hundreds to subtract. This helped you to regroup correctly.
- I can tell sometimes you are not sure when to use perimeter or area. Let's review this together.
- You said a circle is a polygon. What do we know about polygons? Does a circle follow those rules?

+ Scenarios



Here is a writing sample:

i whent to play out side with my sister, ann. She fell down and hurt her arm. i was really skared because i alot of bloud. that was my weknd

In groups discuss the following questions?

How would you provide this child with effective feedback?

What would you address first?

Would you only address one element?

Is there anything you could say to encourage this child?

What does this assessment tell you about this child and your teaching practices?

In what ways will YOU help this child develop these concepts?

+ Scenarios



- Here is a Math example:
 - Catherine has 5 apples. Simrin has 8 apples. How many more apples does Simrin have than Catherine?
Answer: $5 + 8 = 13$
Simrin has 13 more apples than Catherine.

In groups discuss the following questions?

How would you provide this child with effective feedback?

What would you address first?

Would you only address one element?

Is there anything you could say to encourage this child?

What does this assessment tell you about this child and your teaching practices?

In what ways will YOU help this child develop these concepts?

- Formal

- Graphic organizers
- Exit cards
- 3-2-1 cards
- Entry card
- POE exercises
- Windshield checks
- Quizzes



+ Graphic Organizers

You are teaching cause and effect as a reading strategy. A good way to determine a student's understanding of cause and effect is to create a short graphic organizer.

Cause	Effect
	I won the championship soccer game.
I studied for my spelling test.	
I told my mom I did my chores but I was lying.	

Adapted from Chapman & King 2008; Tomlinson & Moon, 2013



Exit card

Adapted from Tomlinson &
Moon, 2013

- You finished teaching a lesson on place value. Try an exit slip to determine students' levels of understanding before adding to their knowledge in the next lesson.

In which number is 7 in the tens place?

- a) 3407
- b) 4784
- c) 3270
- d) 7657

In which number does 1 have the greatest value?

- a) 7381
- b) 1129
- c) 2190
- d) 9010

Which of the following is 20 456 in words?

- a) Two thousand four and fifty six
- b) Twenty thousand four hundred and sixty five
- c) Twenty four thousand four hundred fifty-six
- d) Twenty thousand four hundred fifty-six

Which of the following is 45 780 in standard form?

- a) 45 thousands + 7 hundreds + 8 tens
- b) 4 ten thousand + 5 thousands + 7 tens + 8 ones
- c) 4 ten thousand + 78 hundreds + 5 tens
- d) 45 thousands + 8 tens + 7 ones

+ 3-2-1 Activity

Adapted from Tomlinson & Moon,
2013

- A lesson was completed on the importance of citizenship. Complete a 3-2-1 to assess their comprehension and interest levels.

3 things I learned about citizenship:

2 things I found interesting about citizenship:

1 question I still have about citizenship:

+ POE Exercise

- A POE is a good assessment to complete after a reading, a demonstration, or as a response to a scenario. This assessment is done in small increments.
- Example: You are reading a story called “Raven” with your class.
- As a class read the title and examine the cover page. Read the first page of the story and stop to ask students what they predict (P) will happen next.
- Keep reading. After the end of the story ask students to observe (O) what actually happened and write their responses.
- Then ask students to explain (E) why their first prediction was accurate or not and explain why.

Predict:

Observe:

Explain:

+ Activity

Partners A & B

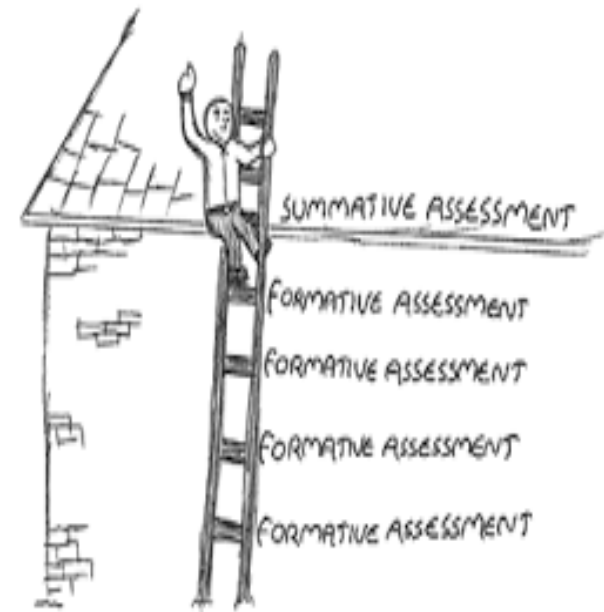
- Divide yourselves into groups of two
 - One person is A
 - One person is B
- Partner A tells one fact he or she learned. Partner B shares another fact he or she has learned. Keep going until you run out of new facts. Partners should not repeat any facts to each other.



Gregory & Chapman, 2007

+ Summative Assessments

- More formal assessments
- Evaluate mastery level at the end of an instructional unit
- Used for grading
- Demonstrates teacher effectiveness
- Shows gaps in learning
- Are aligned with KUDs
- Are called assessments of learning



+ Summative Assessments

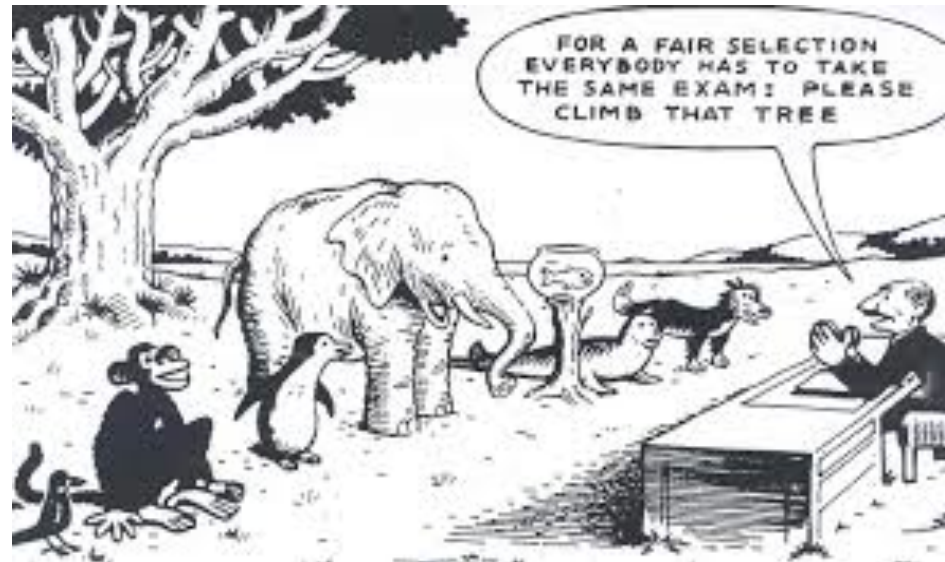
- Assessment should focus on the same essential knowledge despite differentiating by readiness, interest, or learning profile
- Students should be exposed to varied assessments because not all subject material can be analyzed with one test
- Grading system should be the same despite differentiation
- Summative assessments should be authentic and reflect real-world applications
- Demonstrate transfer of skills and knowledge



Tomlinson & Moon, 2013

+ Examples of Summative Assessments

- RAFT (Role, Audience, Format, Topic)
- Portfolios
- Tests
- Projects
- Essays
- Authentic Assessments
- Performance Assessment
- Problems that require critical thinking (situational problems)



Country report presentation



You work for the tourism department of a country of your choice. You have been tasked with creating a PowerPoint that will highlight the unique aspects of your country in order to increase tourism. Your PowerPoint should include the following:

- ★ The name of the country and its capital
- ★ The current leader
- ★ The type of currency
- ★ The main languages
- ★ The climate
- ★ Types of animals
- ★ Which continent / what size is the country
- ★ The current population
- ★ The Religion/ food/traditional clothing
- ★ Any major attractions
- ★ Interesting facts
- ★ Life as a citizen (how is it different or similar to your life)
- ★ Any extra information you found interesting

An example of a project!

Your PowerPoint should also include pictures. Pictures that must appear on your slide show are:



- ★ A picture of the country
 - ★ Locate the country on a world map'
 - ★ A flag of the country
 - ★ Bring in any items that you feel best represent your country (ex: food, clothing, decor...)
-
- ❖ Remember to include a cover slide with the name of the country and your name
 - ❖ Remember to include a final slide (bibliography) with the websites you used.
 - ❖ Use transitions between each slide. Be as creative as possible - add shapes and different font as well as colours. (We will review this in the computer lab)!

+RAFT

Your unit is on persuasive media and texts

Role	You are a producer and a director
Audience	Students in elementary school
Format	Create a video
Topic	You work for an advertising firm and have been asked to create public service announcement on bullying

+ The KUDs of Today's Workshop

KNOW

- Definitions of pre-assessment, formative and summative
- List types of assessments

UNDERSTAND

- Understand how assessments guide instruction
- Why are they essential ?
- How each type assessment is connected ?

DO

- Create pre-assessment, formative and summative assessments
- Analyze what the assessments say about your student

+ This is a Process...

- As expressed last time, DI is a process and takes time to implement.
- Before the next workshop, choose one pre-assessment or formative assessment and implement it in your classroom.
- Be prepared to discuss the data you collected. What did it tell you about where your students are? How will you use this data to guide and inform your teaching?



+ References

Chapman, C., & King, R. (2008). *Differentiated instructional management: Work smarter not harder*. Thousand Oaks, CA: Corwin Press.

All other references can be found in the literature review.

Until Next Time...

"Differentiation is making sure that the right students get the right learning tasks at the right time. Once you have a sense of what each student knows and what he or she needs in order to learn, differentiation is no longer an option; it is an obvious response."





The DI Approach: Pathways to Student Success



Workshop 3

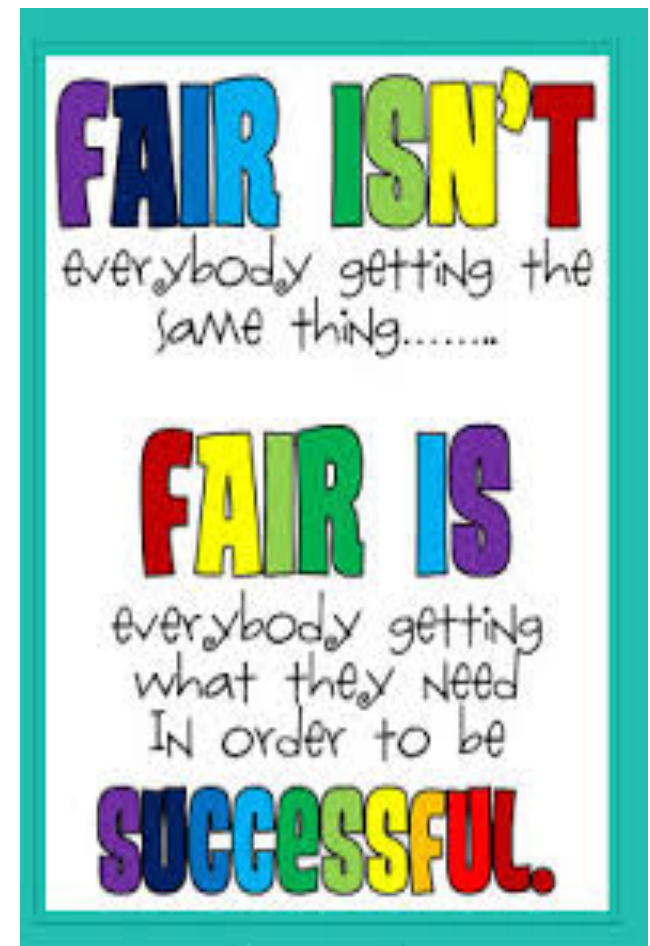


Readiness, Interest and Learning Profile

Simrin Aulakh & Catherine Meloche

+ What are we Doing Today?

- What is Interest?
- Interest in the classroom
- What is Learning Profile?
- Learning Profile in the classroom
- What is Readiness?
- Readiness in the classroom



+ Who did the Homework?

- In small groups share a copy of the assessment you used in your classroom
- What did you notice about your students' prior knowledge?
- What misconceptions did they have?
- In what ways did that help you change your instruction?
- Did you find anything difficult about the process?



Writing Prompt

- On a piece of paper write what you know about student interest.
- Tell us about how interest is explored in your classroom.

OR

- What questions do you have about student interest
- You have 3 minutes to finish your journal.
- When you are done, crumple your entry and throw it in the middle of our workspace.

NOTE: This is a formal pre-assessment

+ What is Interest?



- Is a three-dimensional concept
 - Meaningfulness: the value of a task
 - The more meaningful the task the harder a student will work
 - Impact: importance of a task
 - If the tasks are purposeful, greater interest is fostered leading to a better likelihood that the task will be completed
 - Competence: abilities and prior knowledge
 - How prepared a student is for the task. Better prepared students are more interested in tasks.

• Weber, Martin & Patterson, 2001

+ Why and How to use Interest?

- Interest is linked to intrinsic motivation (Deci & Ryan, 1992)
- Long-lasting learning occurs when interest fosters the dual relationship between the individual and environment (Schiefele, 1991)
- Interest grows when a student is given choice with:
 - The type of task
 - The format of the task
 - The subject



+ Individual and Situational Interest

- Interest is divided into two categories
 - Individual
 - Situational
- Individual interest refers to a personal interest on a specific topic (topic interests).
- Individual interest is more long term and produces longer-lasting learning
- When topic interests are peaked students are more engaged in their learning



Hidi, 1990

+ Individual and Situational Interest cont'd.

- Situational interest is triggered because of an external stimulus
- It is peaked through learning activities
- Interest is also peaked when there is a lack of knowledge
- In a study by Rotgans & Schmidt (2014) it was found that:
 - Lack of knowledge peaked interest
 - Students needed to be aware of their gaps in knowledge
 - Once gaps are filled, interest decreases
- It's important for teachers to keep work challenging to maintain interest



+ Keeping Interest Alive



- Mitchell (1993) found three elements that trigger interest but do NOT maintain interest over time
 - Puzzles: logic puzzles and brain teasers
 - Group work: allows for social interaction and meaningful dialogue
 - Computers provide a different perspective of the concepts
- Two elements that DO maintain interest over time are
 - Meaningful tasks
 - Involvement: Students should be involved in their own learning

+ Teacher Behaviours and Interest

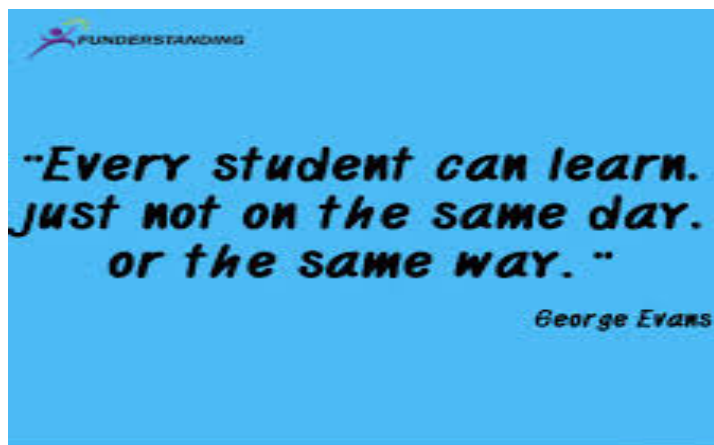
- Effective DI teachers cultivate already existing interests and help students to develop new interests (Tomlinson, 2003)
- Positive teacher behaviors:
 - Modeling
 - Immediate rewards
 - Positive teacher-student relationships
 - Altruism
 - Teacher responsiveness
 - Rewards



Weber, Martin, & Patterson, 2001

+ Strategies for Interest

- Interest centers/groups
- Anchor activities
- Independent study
- RAFT activities
- Interest surveys
- Choice board
 - Tic-Tac-Toe
 - 2-5-8



Interest Survey



READING INTEREST-A-LYZER[®]

Based on the Interest-A-Lyzer by Joseph S. Renzulli

Name _____

Grade _____ Age _____

1.) When I read for pleasure, I pick the following (Check all that apply):

☐ Novels/chapter books	☐ Cartoons/comic books	☐ Humorous books
☐ Sports books	☐ Newspapers	☐ Magazines
☐ Poetry books	☐ Fantasy books	☐ Mystery books
☐ History books	☐ Science books	☐ Scary books
☐ Biographies	☐ Other _____	

2.) If I were in charge of my reading/language arts class, I would have my students do 10 of the following activities (Check 10):

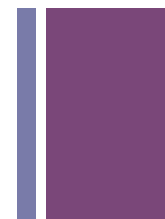
☐ Write a story	☐ Learn sign language
☐ Write a book	☐ Create a game or puzzle
☐ Write a poem	☐ Learn about an author or illustrator
☐ Write a newspaper article	☐ Read a poem
☐ Talk about a book with a friend	☐ Write the story of your life (autobiography)
☐ Write a play	☐ Draw/illustrate a story or poem
☐ Give a speech	☐ Read a true story
☐ Read a favorite book again	☐ Read a biography or autobiography
☐ Read a challenging, new book	☐ Read to learn how to do something
☐ Tell a story	☐ Work on a crossword or other word puzzles
☐ Make a cartoon or comic	☐ Read a book aloud
☐ Learn a different language (Spanish, French)	☐ Watch a play/movie of a book that you have read
☐ Listen to someone read aloud	☐ Write a story about someone's life (biography)

Based on an Interest-Lyzer by Renzulli (1977). Retrieved from : http://tdas.spps.org/uploads/reading_interest_a_lyzer.pdf

+ Tic Tac Toe

Completed in EDPI 654

Template adapted from
Tomlinson & McTighe, 2006

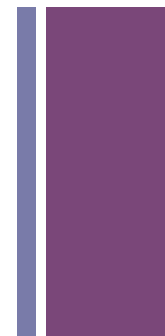


Create a multiplication or a division problem using decimals (in terms of money).	Create a store for the classroom. You need to provide cost of each item and assume to role of a cashier. Provide each student with a fake \$20 bill.	Present to the class – a plan you make for your ideal day, which includes all your favorite activities and figure out the final cost including travel costs.
Find 10 items ranging from \$5 - \$1000 and find the taxes on each item. In a short paragraph explain why the same amount of money in taxes is not applied to each item.	FREE CHOICE 	Create a game for grade 1 on the value of each coin and simple transactions, which include addition and subtraction.
Create a poster to teach your peers the rules of multiplication and division of decimals	Compare the cost of 3 electronic devices between Canada and another country of your choice.	Choose a restaurant and estimate a meal, which would cost including a beverage, an appetizer, a meal and dessert. Compare your estimations to the actual cost.

+ 2-5-8 Activity

Completed in EDPI 654

Template adapted from
Westphal, 2009



1 POINT

- Choose your two favorite hockey teams and draw out their jerseys and determine how much it would cost to buy both of them.
- You have \$5 allowance a week. How much will you have at the end of the month.

2 POINTS

- Create a sale poster that for a MP3 player cost that \$150. The store is having a 70% off sale. Include the regular price and the reduced price on the poster.
- 39 is what percentage of 70?
- Multiply \$10.20 by 0.25?
- Create a book that outlines the steps to solve the following problem: Your favorite shirt is on sale with a discount 20%. The t-shirt costs \$17.99. What would be the cost of 3 t-shirts?

5 POINTS

- With a 20\$ bill what is the most efficient way to spend your money on toiletries. Use the Walmart and Target's website to find the cost of various items. Explain your choices.
- A set of 3 books cost \$24.50. You want to buy 7 books and you have a budget of \$50. Determine the cost of each book and whether of not you have enough money to buy 7 books.
- Create a powerpoint for grade two that teaches how to add with decimals.
- You make \$50 a week is it reasonable to pay for a 50\$ monthly plan. Consider what you have leftover and other expenses such as food, going the movies, going to mall...etc... Explain your answer.

8 POINTS

- Create a game for the class to play on the Smartboard using Smart Notebook that encompasses money.
- Create a video that explains the steps to adding sales tax and applying discounts.
- Create centers for your classroom that address the following topics:
 - 1) Adding money
 - 2) Subtracting money
 - 3) Multiplying decimals
 - 4) Dividing decimals
 - 5) Sales tax
 - 6) Discounts

+ Anchor Activities

Math

Work in challenge math folder

Math games and puzzles

Create math games

Create task cards for your peers

Write a mathematics problem based on the unit we are working on

Create a math play

English

Journaling

Write a letter to a family member

Write a grammar song

Create a play on kindness

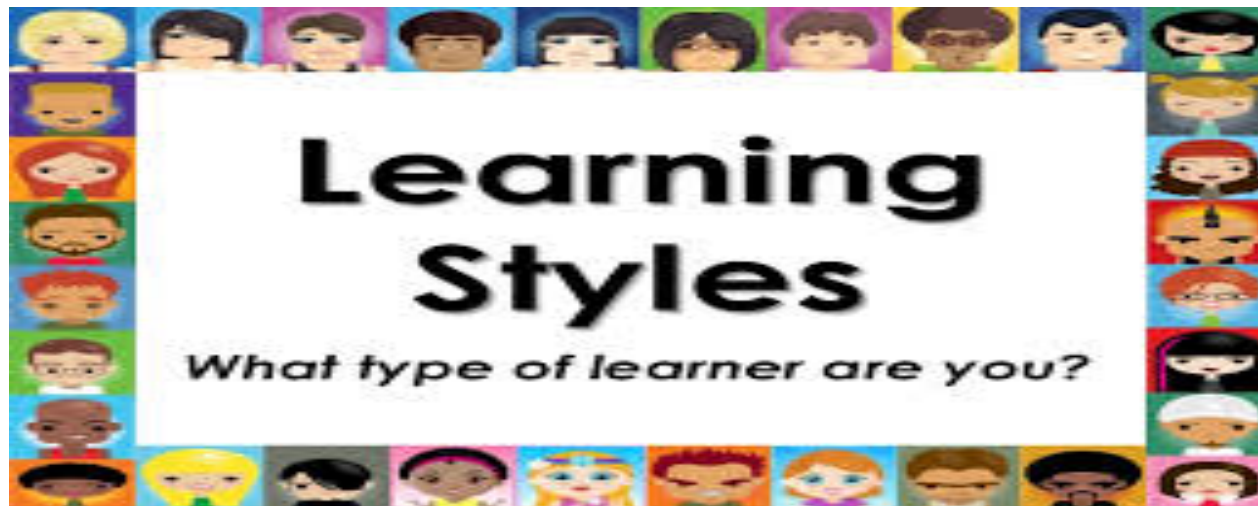
Rewrite the ending of your favorite story

Compare and contrast the characters in a book

+ What is your Learning Style?

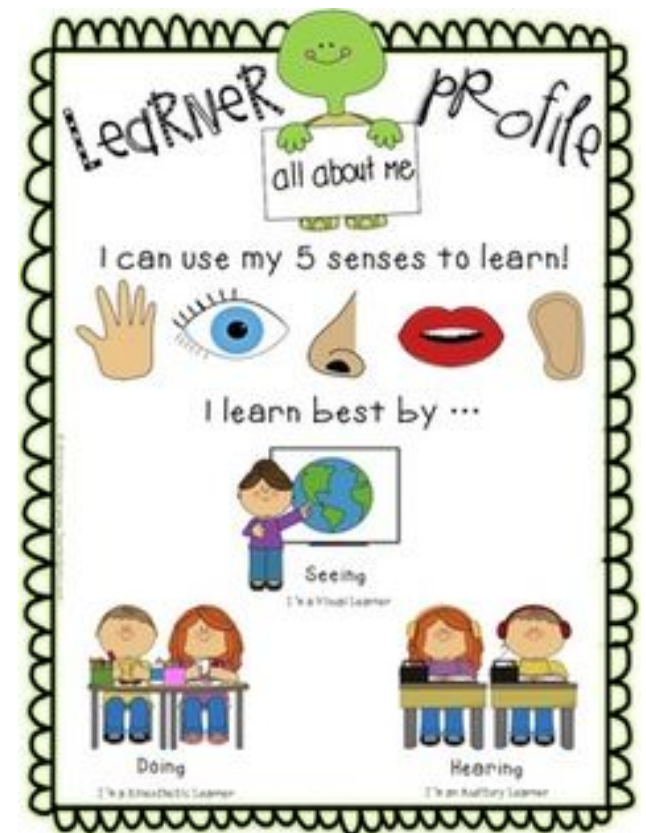
- On your Ipad or labtop take 10 minutes to complete Dunn & Dunn's Learning Profile survey.
- GO TO:

www.learningstyles.net



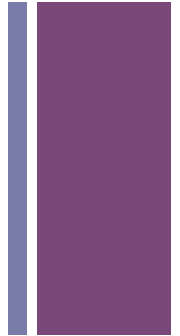
+ What is Learning Profile?

- Students process and internalize information best when we teach using the modality with which they learn best
- Learning profiles and learning styles refer to more than being a visual, kinesthetic, or auditory learner
- Learning styles are part of the learning profile. It is the way in which a student:
 - Attends to
 - Processes
 - Internalizes and retains new information



+ Learning Style Model

- Dunn & Dunn Learning Style Model is divided into five categories
 - Environment
 - Emotionality
 - Sociological preferences
 - Physical preferences
 - Cognitive processing inclinations

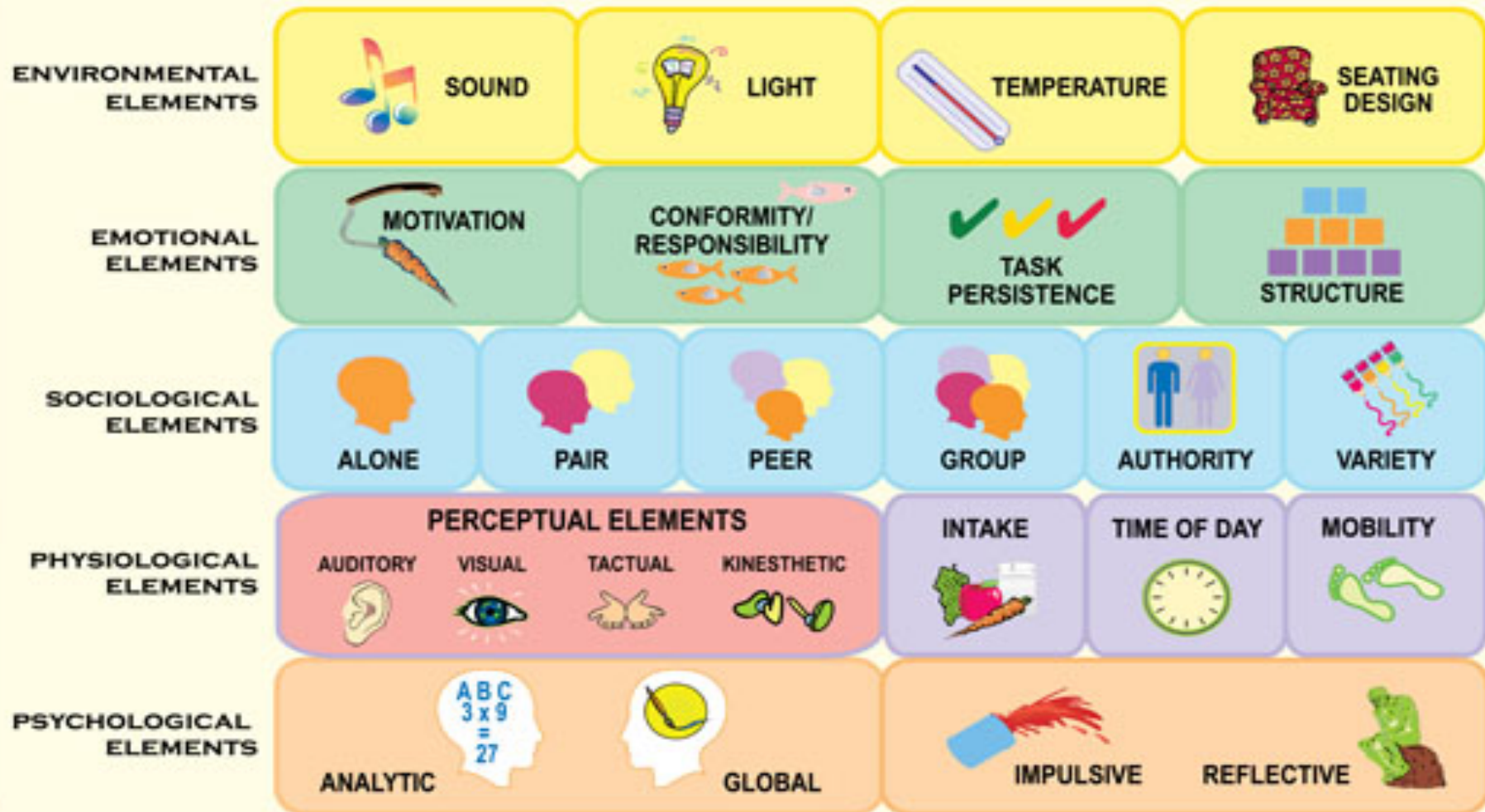


DUNN AND DUNN LEARNING STYLE MODEL

DESIGNED AND DEVELOPED BY DR. RITA DUNN AND DR. KENNETH

STIMULI

ELEMENTS



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+ Incorporating Learning Profile into you Classroom



Traits

- Visual: like to see and observe, pay attention to details, benefit from modeling, read non-verbal cues, organized learners, learn whole to part
- Auditory: vocal, recall and retell easily oral dialogue, good with rote memory, like to listen, part to whole learners
- Kinesthetic: learn by doing, like movement, role play, hands on, good coordination, fidget

What can you do?

- Visual: graphic organizers, visual cues, visualization, project lesson on smartboard, modeling, video
- Auditory: benefit from clear and specific oral directions, listen to stories, use dialogue, recorders, video, peer teaching, music
- Kinesthetic: role play, make model, conduct experiments, need physical movement (brain breaks)

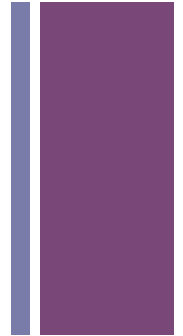
Gregory & Chapman (2007)

+ Types of Learning Profiles



- Kolb (1984, as cited in Gregory 2005) explained four different learning profiles
 - Divergers : like to share ideas, enjoy discussions, want to be at ease in their environment, value a warm environment, and enjoy the learning process
 - Assimilators: investigators, enjoy research, deep understanding, and like to learn from experts
 - Convergers: a practical learner, seeks relevant information, organizes information, and needs clear goals
 - Accommodators: like to try new things, open to new ideas, like to be creative, risk-takers, and independent thinkers

+ Benefits of Learning Profile



- Lovelace (2005) found that
 - Learning styles increased achievement
 - Improved attitude toward learning
- In Rosenfeld & Rosenfeld (2008), teachers learned about their own learning styles
 - teachers intervened more when they developed a better understanding of learning styles
 - They identified and addressed learning styles in the class
 - Students had more success



+ Lesson Planning



- You will be divided into groups based on the cycle and subject matter you teach
- Choose a topic and create a lesson plan
- Now that you have a better understanding of learning profiles create a lesson that will consider the diverse learning styles of your classroom

Time to share

What resources did you use to address the different learning profiles in your class?

Did you address learning profile in each part in your lesson plan?

+ Something to Note...

- Learning styles instruction should not be the only approach when differentiating. It should not override the importance of differentiating by readiness levels.



+ What is Readiness?

- Readiness refers to understanding a student's background, prior knowledge, and learning capabilities
- How close a student is to specific learning goals
- A classroom has a wide variety of readiness levels
- A teacher needs to identify a student's ZPD with assessments
- Effective teachers need to be flexible when differentiating by readiness levels and provide students with the right material that target specific needs



+ Adapting Instruction

- Teachers can adapt instruction to readiness levels by modifying:
 - Content: materials used for a unit, should be challenging but manageable
 - Process: activities that help students understand the content
 - Product: end result of a unit
- Pierce & Adams (2014); Pham (2012)



+ Identifying & Analyzing Readiness Levels

- You can modify the way a student is introduced to the content using
 - Graphic organizers
 - Visual aids
 - Auditory aids (clear and concise instructions, repetition, and one-on-one instruction)
 - Manipulative
 - Scaffolding
- You can modify process by
 - Tiered activities
 - Scaffolding
- You can modify product by
 - Authentic assessments
 - Performance tasks
 - Problem based inquiries
 - Portfolios



+ Scaffolding & Tiered Activities

- To guide students through their ZPD teachers should scaffold
- “Scaffolding instruction may be best understood as a sequence of prompted content material, and teacher or peer support to facilitate learning” (Bender, 2002, p.54)
- Another strategy is to use tiered assignments
- “Tiered assignments are differentiated learning tasks and projects that you develop based on your diagnosis of students needs” (Heacox, 2002, p.91)
- We will be covering these concepts in more depth during a future workshop.



+ Post-it Note Exit Slip

- Along the wall you will see three posters labeled interest, learning profile, and readiness
- On the pink post-it note write something you learned about interest
- On the purple post-it note write something you learned about learning profile
- On the yellow post-it notes write something you learned about readiness



NOTE: Formative Assessment

+ Final Discussion



- What misconceptions did you have about readiness, interest, and learning profile before today?
- Do you feel better equipped to incorporate these concepts in your lesson planning?
- Which concept do you think will be easiest to implement and why?
- Did today's workshop reinforce some of your current teaching practices?

+ Homework

- We would like each of you to try to implement interest, readiness, or learning profile into your lesson planning before the next workshop.
- Come prepared to share your experiences!



+ References

Renzulli, J. S. (1977). *The Interest-a-lyzer*. Mansfield Center, CT:
Creative Learning Press.

Westphal, L. E. (2009). *Differentiated instruction with menus:
Math, Numbers and operation*. Waco, Texas: Prufrock Press.

All other references can be found in the literature review.

Until Next Time...



If a child can't
learn the way we
teach, maybe we
should teach the way
they learn.

Ignacio Estrada

meetville.com



The DI Approach: Pathways to Student Success



Understanding by Design

Simrin Aulakh and Catherine Meloche

+ What are we doing Today?

- Review of last week
- Understanding by Design
- Steps in UbD
- A review of UbD
- Create your own UbD

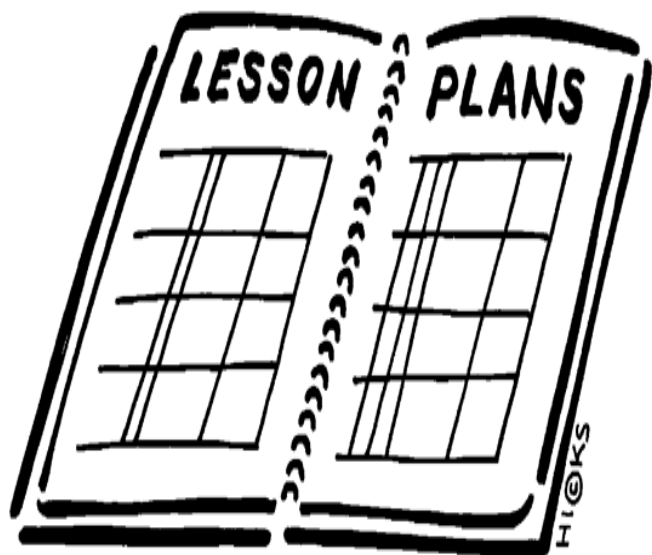


+ Review of the Homework

- We are going to divide you into three groups based on whether you implemented readiness, learning profile or interest into your lesson planning.
- In your group, discuss how you considered and addressed these elements?
- What were some of the positive outcomes you noticed?
- What were some barriers that you encountered?
- What did you notice about your student's level of engagement?



+ How do you Plan?



Gregory and Chapman, 2007

- Squaring Off – An example of a pre-assessment from workshop 2. Let's get you up and moving!
- On opposite sides of the wall you will see a YES and a NO poster. As we ask you questions, move to the answer that best reflects your teaching practices.

Let's get started!

- You've decided to start a new concept. Do you plan the whole unit in advance?
- Do you plan your lessons day-to-day?
- Do you have a specific end goal in mind?
- Have you considered what key concepts or essentials questions you want your students to grapple with?

+ How do you Plan cont'd.

- Do you tailor your lessons to learning profile?
- DO you tailor your lessons to readiness?
- Do you tailor your lessons to interest?
- DO you use pre-assessments to guide your instruction?
- Do you make adaptations during a lesson in the classroom, while you are with the students?
(Example: You planned a lesson, Tommy is struggling, you tell him to only do 3 problems).



+ Let's Discuss

- When we started as teachers, we were concerned with being able to cover all the material. We wanted to create engaging learning activities, we adjusted as we went along, hoping that we were covering the scope of the curriculum.
- We realize now through our research, that as teachers we must first be designers. We shouldn't focus as much on coverage but rather on developing a deep understanding of the content.



-
- A word cloud visualization of terms related to curriculum design and understanding. The words are arranged in a circular pattern, with 'understanding' and 'curriculum' being the largest and most central. Other prominent words include 'learning', 'design', 'plan', 'teaching', 'transfer', 'inquiry', 'ideas', 'assessment', 'framework', 'effective', 'map', 'misunderstanding', 'backward', 'map', 'effective', 'misunderstanding', 'backward', 'map', 'effective'.

Wiggins & McTighe, 1998

Title of Unit		Grade Level	
Curriculum Area		Time Frame	
Developed By			
Identify Desired Results (Stage 1)			
Competencies			
Understandings		Essential Questions	
Overarching Understanding		Overarching	
Students will understand that.... (3-5 understandings)		Understandings turned into key questions	
Related Misconceptions			

Wiggins & McTighe, 1998

Knowledge Students will know...		Skills Students will be able to...	
Assessment Evidence (Stage 2)			
Performance Task Description (separate sheets)			
Goal/ Role			
Role/ Audience			
Audience/ Format			
Situation/ Topic			
Product/Performance			
Standards			

Other Evidence (general ideas for ongoing assessment, self-assessment)

Learning Plan (Stage 3) – include ongoing assessment ideas (*separate sheets)

Where are your students headed? Where have they been? How will you make sure the students know where they are going?

Pre-assessment *

How will you **hook** students at the beginning of the unit?

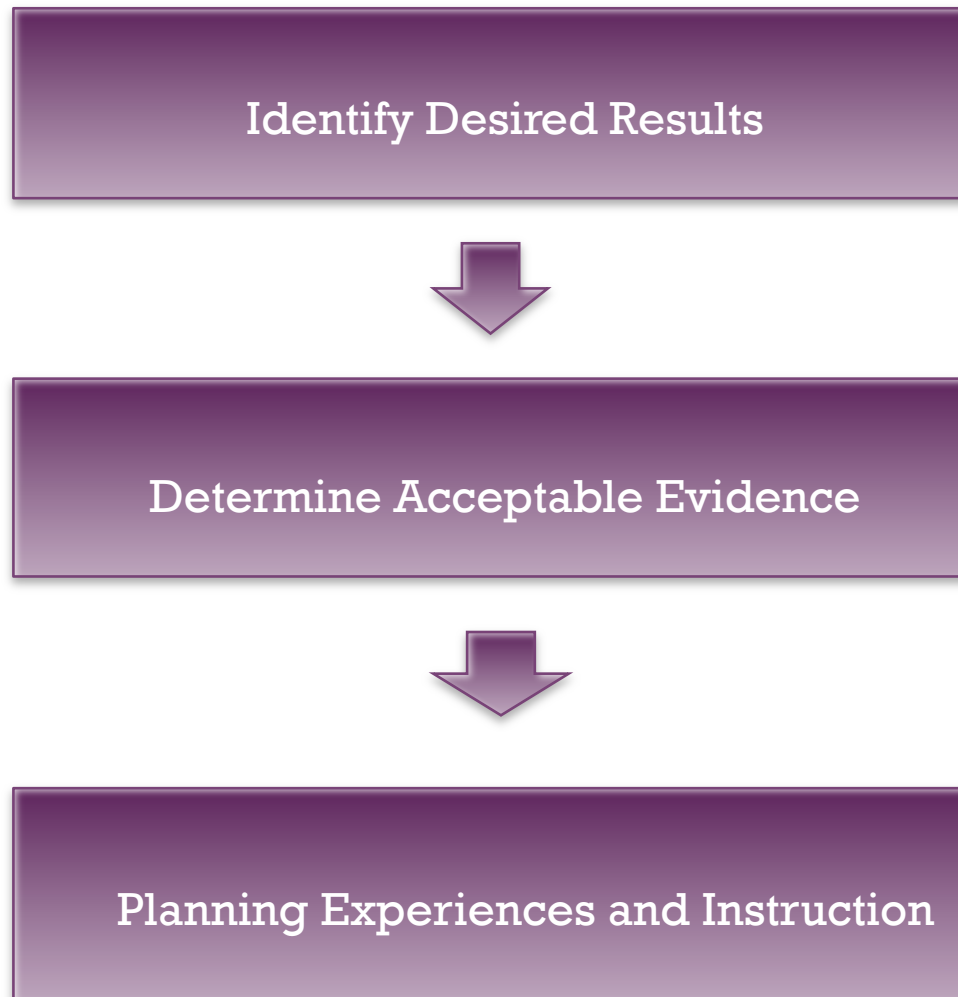
Entry Point

What events will help students **experience and explore** the big idea and questions in the unit? How will you equip them with needed skills and knowledge?

Tiered Activity *

How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work? Recoding all new information	
How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit? Self-Evaluation *	
How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit? *Differentiate by Learning Profile AND *Differentiate by Interest	
How will you organize and sequence the learning activities to optimize the engagement and achievement of ALL students? Maximize involvement of all students	

+ Steps in UbD



+ Identify Desired Results

- Identify the desired results – this a time for reflection
 - Identify the competencies from the QEP that will guide your unit
 - What did students learn in previous years?
 - What are students learning in other classes?
 - What will they be expected to learn next year?
 - Why are we doing this? How is it doing to apply to my student's lives? How will they use this in the real world?



Wiggins & McTighe, 1998

+ Identify the Desired Results

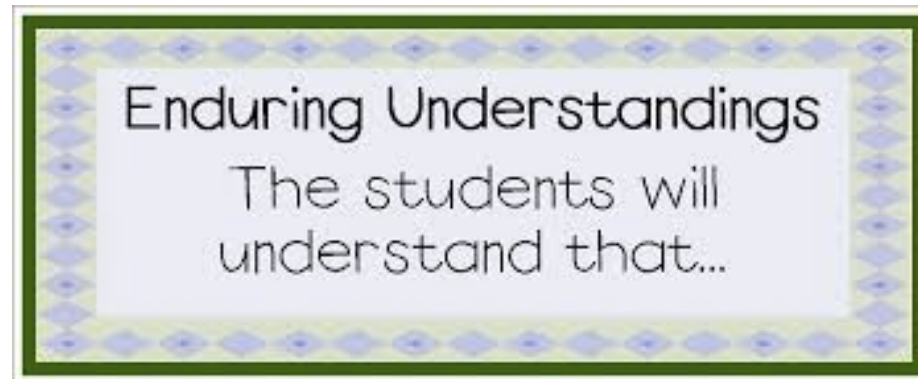
- Identify what you want the KUDs of the unit to be?
 - Let's Review: Who can define what the K, the U, and D stand for?
- There are three types of knowledge that you need to identify during this stage
 - What is worth being familiar with? (What does the student need to know to develop deep understanding and identify common misconceptions)
 - What's important to know and do? (These are the skills and knowledge students need to achieve the end goal)
 - What deep understanding do you want students to have?

Wiggins & McTighe, 1998



+ Understandings

- What students need to work through and understand in order to develop deep understanding (Wiggins & McTighe, 1998)
- Example
 - If you were doing a unit on money, you would want your students to understand,
 - Decimals,
 - operations with decimals
 - Money and everyday life
 - Canadian currency
 - Relationship between dollars and cents
 - Place value



+ Essential Questions

- Essential Questions are a major part of the UbD template. It takes time and reflection.
- These Questions
 - Engaging
 - Core of the subject matter
 - Have no simple answers – are not yes or no questions
 - Thought provoking
 - Questions are revisited throughout the unit and across different years
 - Lead to other questions



Tomlinson & McTighe, 2006

+ Examples of Essential Questions

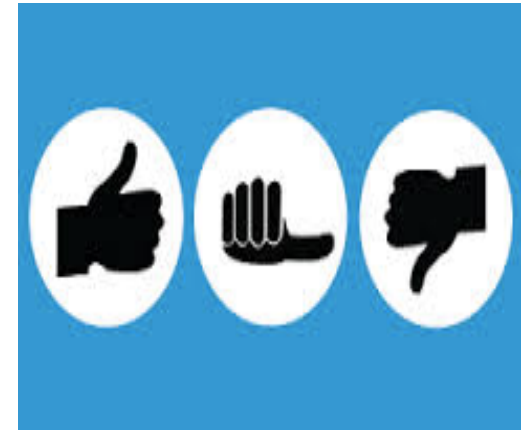
- Thumb it up – this is an example of a formative assessment found in workshop 2
- We will ask a series of questions, if you think it is an essential question give us a thumbs up! If you think it is not an essential question give us a thumbs down! If you are unsure point your thumb to the side!
- After each question, be prepared to answer why you think it is or is not an essential question.



+ Thumb it Up!

■ Here we GO!

- How does literature reflect life?
- What is a fraction?
- What makes a story interesting?
- How are mathematical operations connected?
- What are the elements of a fairy tale?
- How does measurement affect our understanding of space?
- What are the elements to writing a story?
- How do grammar conventions lead to effective communication?

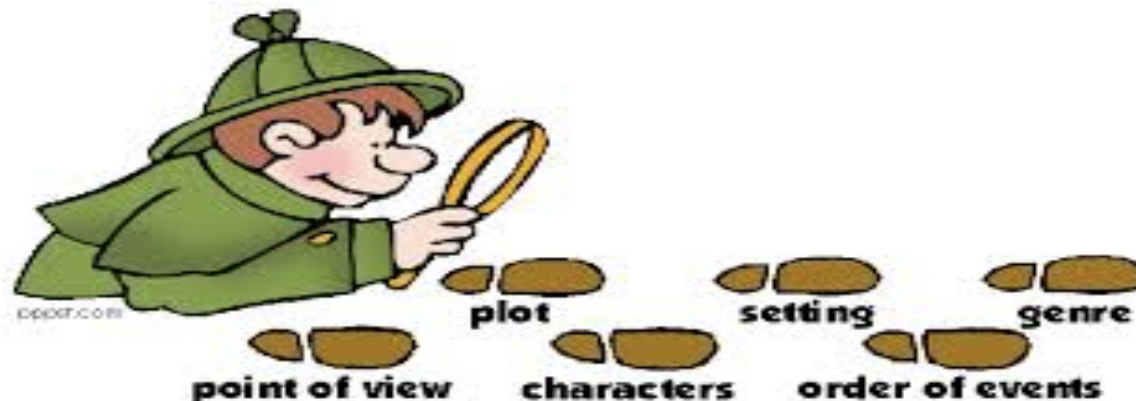


Gregory & Chapman, 2007

+ Essential Questions and Understandings

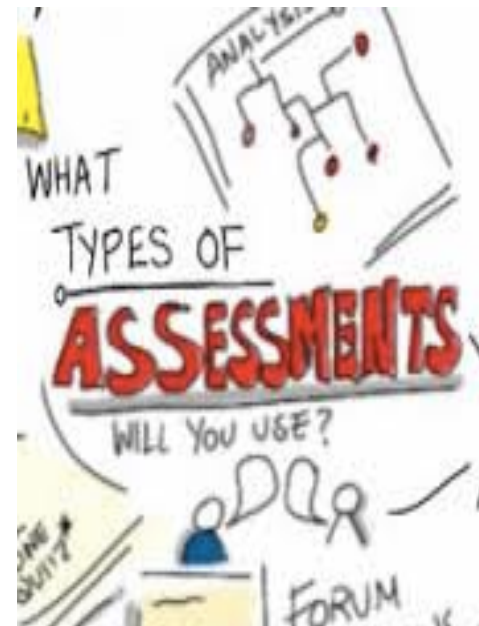
- Competency: Reads/Listens to spoken, written, and media texts (Elementary QEP, 2001)
 - Unit: Literary Elements

Together let's come up with some understandings and essential questions based on the competency and unit we provided. You can write them down on the sheet provided in your manual.



+ Determine Acceptable Evidence

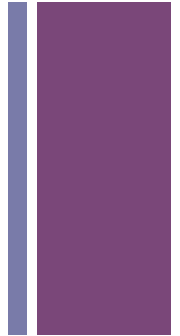
- Now we are evaluators of learning
- Create assessments
- At this stage of planning, it is important to forget about the learning activities, the lesson planning, and the materials in order to have an efficient unit design. This is not an easy task as we have been conditioned to focus on these elements throughout our teaching careers.
- When you plan assessments prior to starting a unit it allows for units to be logical, clear, and focused around deep and lasting understanding
- Performance tasks at the end of the unit should focus on real world application



+ RAFT

- The RAFT is one type of authentic assessment
- The R refers to Role: This is the role you will ask the students to play. (For example you may ask them to be a journalist, a cashier, a scientist, a manager, a politician etc.)
- The A refers to Audience: Who are creating the product or performance for.(For example, the public, clients in a store/restaurant, patients, voters etc.)
- The F refers to Format: This is the format your students will use to present their knowledge and understanding (Example: article, budget, speech, research report, ad campaign, etc.)
- The T refers to Topic: It is the situation you are placing the students in to carry out their role. Topics should be very specific. (Example: You are a politician seeking to win the next leadership race, you have been tasked with designing your new campaign to convince your fellow party members to vote for you)

+ GRASP



- GRASP is another type authentic assessment
- G is for Goal, which states the objective of the task
- R is for Role, which is the role that the students take on to complete the task
- A is for the Audience that fits the context of the task
- S is for the Situation which refers to the actual context in which the student is performing
- P is for Product, what the student will create

Tomlinson & McTighe, 2006

+ Develop a RAFT

Complete the following raft remembering that the unit is based on literary elements

Role	
Audience	
Format	
Topic	You have just been asked to write a children's story

Fill in the raft provided in the manual

+ Planning Instruction



- It is time to focus on what activities will allow students to get the knowledge and skills they need to be successful
- Determine the sequence of activities that will be most effective?
- Determine the most effective teaching strategies to use?
- Consider interest, readiness, and learning profile when planning
- Develop a tiered activity
- “Teaching is a means to an end. Having a clear goal helps us as educators to focus our planning and guide purposeful actions toward the intended results” (Wiggins & McTighe, 1998, p. 13)

Title of Unit	Learning How to Use Money	Grade Level	Cycle 3 Year 2
Curriculum Area	Math	Time Frame	4 weeks
Developed By	Catherine Meloche and Simrin Aulakh		

Identify Desired Results (Stage 1)

Competencies

Use mathematical reasoning
Solves a situational problem
Communicates by using mathematical language

Understandings	Essential Questions	
Overarching Understanding	Overarching	
Students will understand that.... (3-5 understandings) -Money essential in our daily lives because we need money to purchase goods and services and sustain our basic needs (for example; food, clothing, shelter) -Money is valuable because it is important to understand the correlation between the amount of money you have and the costs of goods and services -Money can be organized in different ways; budgets are used to divide and organize money. Budgets involve knowing what your expenses are and how much money you have to allocate to these given expenses. - Estimation is essential because it allows for quick mental math to determine if we have enough money when purchasing goods.	Understandings turned into key questions • How do we use money in our everyday lives? • Why are budgets important to managing money? • Why is it important to budget? • Why do we need to consider how much money we have in relation to how much we spend?	
Related Misconceptions		
Money is easy to attain When you are working you spend what you want Money never runs out		

Knowledge Students will know...		Skills Students will be able to...	
What is a budget Budgets can be used to organize money Budgets can broken into different categories Taxes are attached to goods and services How to estimate total cost How discounts are applied to items Rules for working with decimals in addition, subtraction, multiplication and division Vocabulary associated with money: tax, discount, rebate, sale, cost, salary, dollar, cents, currency, estimation, toonies, loonies , nickel, dime, quarter		Create a budget Multiply and divide decimals Calculate taxes Estimate cost of items Calculate percentage and its relation to money	
Assessment Evidence (Stage 2)			
Performance Task Description (separate sheets)			
Role	Head of a household; from a given salary and household spending create a budget for groceries		
Audience	A family; Students will be given different family situations and must create a budget that considers the needs of their particular family.		
Format	A budget that allocates weekly and monthly allowance for food. The budget for food should be in line with greater household budget. A grocery list. Should consist of healthy food options.		
Topic	Students in groups of two will be given one of three household budgets (see Addendum #1) , which includes; salary, mortgage or rent payments, general living and miscellaneous expenses and will be asked to create a budget for groceries for one month. Each group will receive a different type of household and based on varying circumstances will budget accordingly. They should create a weekly food allowance along with a grocery list that is filled with healthy choices, which include all the food groups while keeping in mind the number of members in the household.		
Product/Performance			
Standards	Completed in EDPI 654		

ADDENDUM #1 : RAFT

You and your partner will create a monthly and weekly food allowance along with a grocery list for one week. It should be filled with healthy choices, which include all the food groups while keeping in mind the number of members in the household you have been given. Happy shopping!

Two income household • Two Adults • Two children	Single income household • One Adult • Two children	Two – income household • Two adults • Two children • One grandparent
Income: \$ 100 000.00 per year Mortgage: \$ 2000.00 per month Saving: \$ 1500.00 per month General Living Expenses & Miscellaneous: \$ 2700.00 per month Groceries per month: _____ Groceries per week: _____	Income: \$ 30 000.00 per year Rent: \$ 750.00 per month Saving: \$ 0 General living expense & Miscellaneous: \$ 1000.00 per month Groceries per month: _____ Groceries per week: _____	Income: \$ 50.000 per year Rent: \$1500.00 per month Saving: \$ 850.00 per month General living expenses and Miscellaneous: \$ 2000.00 per month Groceries per month: _____ Groceries per week: _____

Other Evidence (general ideas for ongoing assessment, self-assessment)

Self-assessment	Double Entry Journal
Exit cards	Huh? Aha!
Check in slips	Quick check in Quiz
Pre-assessment	Teacher Feedback
3-2-1	Think Pair Share
AB partners	

Learning Plan (Stage 3) – include ongoing assessment ideas (*separate sheets)

Where are your students headed? Where have they been? How will you make sure the students know where they are going?

Pre-assessment *

Identify the value of each coin
Add and subtract with decimals
List of items and guess the cost
How does one earn money
Multiplication and divide decimals
Calculating percentages

[See Addendum #2](#)

How will you **hook** students at the beginning of the unit?

Entry Point

Use the following video as a lead in to discuss how people make money.
Teaching kids about money- where do children think money comes from
<http://www.youtube.com/watch?v=eGuQIYd6n4>

What events will help students **experience and explore** the big idea and questions in the unit?
How will you equip them with needed skills and knowledge?

Tiered Activity *

Students will be given activities based on their readiness level that allow them to explore and engage with an authentic task. [Please see Addendum #3](#) (This will be covered in workshop 5)

ADDENDUM # 2 : Pre-assessment

1) Identify the value of each coin below:









2) Add the following decimal problems:

$$21.34 + 22.56 =$$

$$138.09 + 2.34 =$$

$$324.99 + 143.09 =$$

3) Subtract the following decimal problems:

$$39.80 - 10.90 =$$

$$250.50 - 43.45 =$$

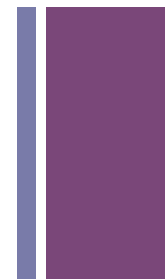
$$130.00 - 114.14 =$$

How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work? Recoding all new information	321 activity: 3 things you learned 2 things you're not clear about 1 way you apply what you have learned AB partners: Turn to a partner and discuss the important elements of creating a budget
How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit? Self-Evaluation *	Students will be given a variety of self-assessments to determine their understanding of the mathematical concepts being taught. Jigsaw rubric - http://www.exemplars.com/assets/files/puzzle.pdf see Addendum # 6 Exit cards KUD – See Addendum # 7 Answer Questions – See Addendum #8
How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit? *Differentiate by Learning Profile AND *Differentiate by Interest	In order for students learning to be differentiated by readiness, interest and learning profile they will be given several different choices, which are tailored to their needs. TIC TAC TOE: See Addendum # 4 (As seen in Workshop 3) 2 – 5 – 8 : See Addendum # 5 (As seen in Workshop 3)
How will you organize and sequence the learning activities to optimize the engagement and achievement of ALL students? Maximize involvement of all students	The unit will begin with an entry point and pre-assessment. The entry point will allow students to develop the knowledge they already have and allow them to engage with the topic. The pre-assessment will allow the teacher to identify the level of the students' knowledge coming into the unit and identify any misconceptions the students have. Following the entry point and pre-assessment, the students will be provided with short, frequent lessons. Students will be asked to recode the new information after each lesson to allow the teacher to ensure that students understand the material. Students will be provided with several opportunities to engage with the material through activities and assessments. Students will be given different options that address their interests, learning profiles and readiness levels. Students will also be provided with an opportunity to conduct a self-evaluation in which they will reflect on what they have learned throughout the unit. The unit will culminate with an authentic task that will provide students with the opportunity to demonstrate their knowledge and skills.

ADDENDUM # 6 : JIGSAW RUBRICTAKEN FROM : <http://www.exemplars.com/assets/files/puzzle.pdf>

LEVEL	PROBLEM SOLVING	REASONING & PROOF	COMMUNICATION	CONNECTIONS	REPRESENTATION
NOVICE Makes an effort No or little understanding	I did not understand the problem.	My math is not correct.	I used no math language and/or math notation.	I did not notice anything about the problem or numbers in my work	I did not use a math representation to help solve the problem and explain my work.
APPRENTICE Okay, good try Unclear if students understand	I only understand part of the problem. My strategy works for part of the problem.	Some of my math thinking is correct.	I used some math language and/or math notation.	I tried to notice something, but it is not about the math in the problem.	I tried to use a math representation to help solve the problem and explain my work but it has mistaken in it.
PRACTITIONER Excellent Clear Strong Understanding Meets the Standards	I understand the problem and my strategy works. My answer is correct	All of my math thinking is correct.	I used math language and/or math notation accurately throughout my work.	I noticed something about my work.	I made a math representation to help solve the problem and explain my work and it is labeled and correct.
EXPERT Wow, awesome! Exceptional Understanding	I understand the problem. My answer is correct. I used a rule, and/or verified that my strategy is correct.	I showed that I knew more about the math idea that I used in my plan. Or, I explained my rule.	I used a lot of specific math language and/or notation accurately throughout my work.	I noticed something in my work, and used that to extend my answer and/or I showed how this problem is like another problem.	I used another math representation to help solve the problem and explain my work in another way.

+ KUD Exit Card



ADDENDUM # 7 : KUD

KNOW: The rules for adding, subtracting, multiplying and dividing decimals.

UNDERSTAND: Describe the steps in creating a budget.

BE ABLE TO DO (SKILLS): Provide and solve a money problem for each computation (+, -, $\times$, $\div$) involving decimals.



ADDENDUM # 8 : ONGOING ASSESSMENT

$21.34 + 22.45 =$	3 apples cost \$5.15 . How much does one cost?	$235.88 - 21.34 =$
$450.00 + 56.78 =$	There is a discount of 35%. The item originally cost \$55.34. How much does it cost after the discount?	$65.99 - 64.23 =$
$45.67 - 2.35 =$	$3 \times 334.99 =$	$12.25 \times 4.50 =$

+ Be a Designer!

- You are going to create and design your own UbD in pairs. You can choose any subject area, cycle, and competency you wish to address.
- We encourage you to plan a unit that you will be able to take back to your classroom and implement!
- We will be circulating and sitting with each of you to discuss your plans
- Today we will focus on
 - Step One: Identifying the Desired Results (25 minutes)
 - Step Two: Determining Acceptable Evidence (25 minutes)
 - Step Three: We will wait till Workshop 5

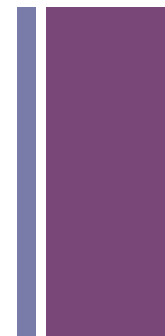




Step One: Fill in these Sections

Title of the Unit		Grade Level	
Curriculum Area		Time Frame	
Developed by:			
Identify Desired Results (Step 1)			
Competencies			
Understandings		Essential Questions	
<i>Students will understand that...</i>		<i>Understanding turn into key questions</i>	
Related Misconceptions			
Knowledge Students will know		Skills Students will be able to do	

+ Step 2: Fill in these Sections



Assessment Evidence (Stage 2)	
Performance Task Description	
Goal/Role	
Role/Audience	
Audience/Format	
Situation/Topic	
Product/Performance	
Standards	
Other Evidence (general ideas for ongoing assessment and self-assessment)	

+ Homework

- In your pairs, one of you create the pre-assessment for your unit and the other should create a formative assessment for the next workshop.



+ References

Rubric Retrieved from:

<http://www.exemplars.com/assets/files/puzzle.pdf>

All other references can be found in literature review

Until Next Time...

+

Every teacher
needs to improve,
not because they
are not good
enough, but
because they can
be **EVEN BETTER.**
Dylan William



The DI Approach: Pathways to Student Success



Tiered Activities & Scaffolding

Simrin Aulakh & Catherine Meloche

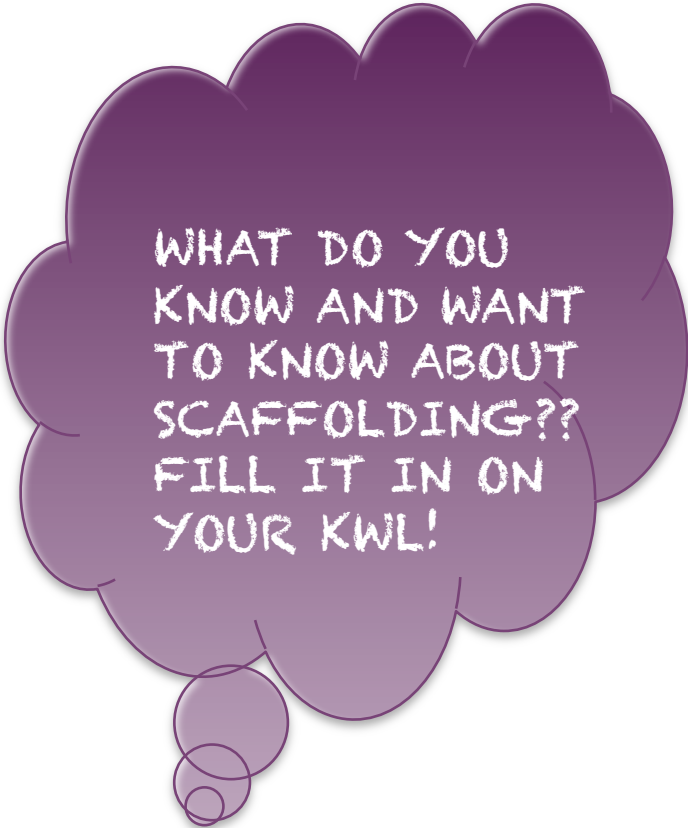
+ What are we Doing Today?

- Scaffolding
- Scaffolding Strategies
- Tiered Activities
- Bloom's Taxonomy
- Step 3 of your UbD

A child without
education, is like a
bird without wings.
~Tibetan proverb

+ What do you know about Scaffolding?

- KWL activity – an example of a pre-assessment from workshop 2
- You have a KWL in your package
- Remember KWLs should be used with caution because it allows you to gain an understanding of your classroom as whole but does help to hone in on individual needs.
- The K (What I Know) – done before lesson
- The W (What I Want to Know) – done before lesson
- The L (What I Learned) – done after lesson



WHAT DO YOU
KNOW AND WANT
TO KNOW ABOUT
SCAFFOLDING??
FILL IT IN ON
YOUR KWL!

Tomlinson & Moon, 2013

What I Know K	What I Want to Know W	What I Learned L
		Tomlinson & Moon, 2013

+ The Past into Action



- As discussed in the readiness section a teacher's job is help navigate students through their ZPD
- We have shown you how to determine levels of readiness, interest, and learning profile through pre-assessments
- Now we adapt our instruction and materials in order to meet our students' needs based on the data we collected
- This our opportunity to put pre-assessments and formative assessments to use

+ Scaffolding

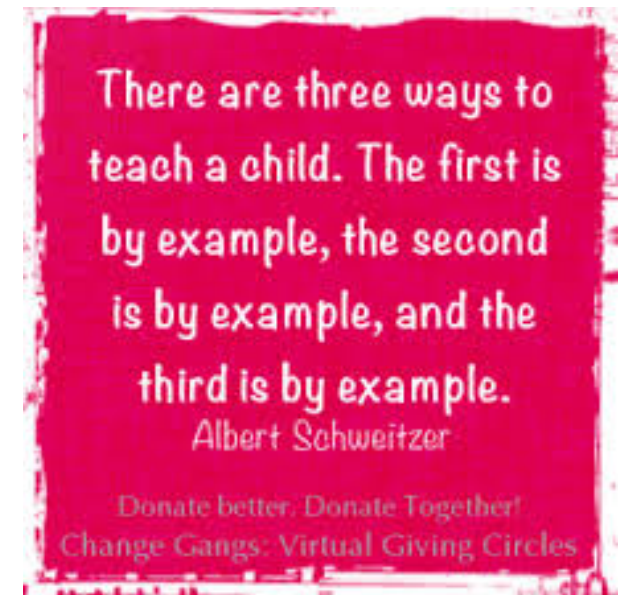
- Scaffolding is a strategy used to guide students' to move through the ZPD levels
- “Scaffolding instruction may best be understood as a sequence of prompted content, materials, and teacher or peer support to facilitate learning” (Bender, 2002, p.54)
- There are several strategies a teacher can use when scaffolding



+ Scaffolding Strategies

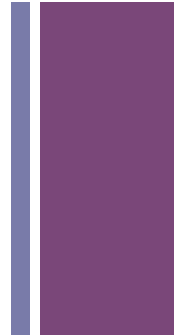
■ Modeling

- Teachers or expert peers serve as models to demonstrate how to solve a problem and use skills needed to think critically. Students observe and then carry out a similar tasks independently or with support.
- As you are modeling a concept make sure you are being verbal. Explain your thinking, what you are doing and why you are doing it.
- Student's imitate the process
- EXPLAIN EVERY STEP OF THE PROCESS
- If modeling is explicit it allows students to understand the thought processes and the actions involved to complete the task



Bliss, Askew, & Macrae, 2006

+ Scaffolding Strategies cont'd.



■ Questioning

- Helps students gain clarification. Provides students with the chance to make adjustments and fix misconceptions.
- You are asking questions to guide students in the right direction
- Ask open-ended questions
- Used as prompts
- Questions should cause the student to reflect
- Helps students to draw on prior knowledge
- Great way to get a better understanding of where student with their understanding of a concept

Example:

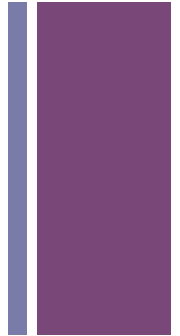
A student is working on a math problem, you notice they are struggling.

You can ask:

- What do you know about fractions?
- Is there an operation that can help you figure out this step?
- What do you know about adding fractions with the same denominators?
- What do you know about adding fractions with different denominators?

Hogan & Presley, 1997

+ Scaffolding Strategies cont'd.



■ Feedback

- Allows students to compare their work to a standard.
- Students are able to learn from their mistakes and adjust.
- Provide with an example of what you expect
- Feedback should be specific
- Feedback is in relation to the criteria

■ Cognitive Structuring

- How students organize information to use for future tasks.
- Providing student with tools to use, such as concept maps, graphic organizers, and strategies for memorization
- Helps develop metacognition

Bliss, Askew, & Macrae, 2006; Sanders & Welk (2005)

+ Scaffolding Strategies cont'd.

■ Instructing

- When teacher provides student's with foundational knowledge.
- The point of instruction is that it should transfer to developing metacognitive skills
- Teacher-directed
- Tell students what do to
- Tell how to do something
- Tell students why

+ Support for Scaffolding

- Lutz, Guthrie, and Davis (2006) study examined reading comprehension and the use of scaffolding
 - Classes with high levels of scaffolding showed stronger growth in reading
 - Were able to reduce scaffolding and do complex tasks with limited support
 - Classes with moderate levels of scaffolding didn't show as much growth in reading levels
 - Consistently needed scaffolding and to complete basic tasks



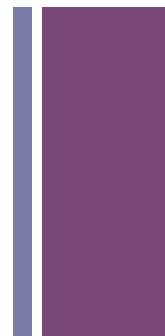
+ Jeopardy Time

Answer in the form of Questions

- You have a student working on a math problem. She keeps getting stuck in the same place and continues to make the same mistakes. Which scaffolding strategy would you use?
- You have a student with executive functioning difficulties. You are about to start writing a story and you know he has trouble planning and sequencing. What scaffolding strategy would you use?
- You are teaching your class how to work through the steps of situational problem for the first time? What scaffolding strategy would you use?
- Your student has completed a writing assignment and missed key elements? What strategy would you use?



+ Finishing our KWL

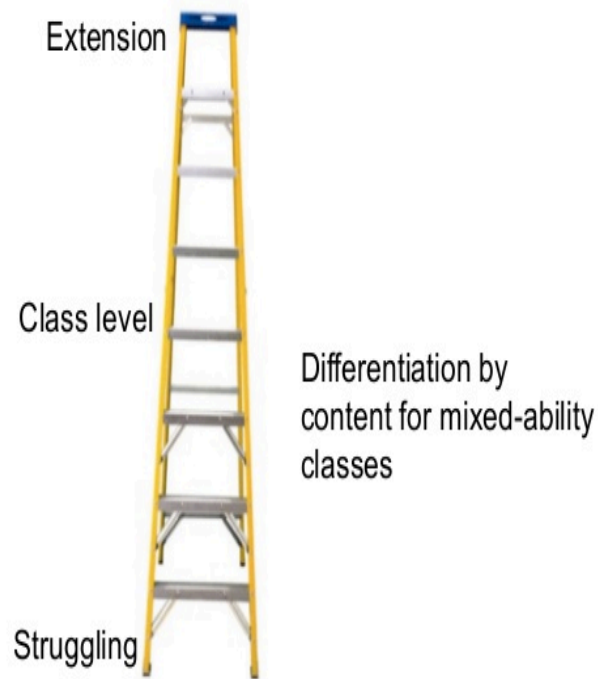


What I Know K	What I want to Know W	What I Learned L

Tomlinson & Moon, 2013

+ Tiered Activities

1. Tiered Activities



- This is another way to adapt teaching to readiness, interest, and learning profiles
- They are created based on student's needs
- Tasks in tiered lessons are made to fit the developmental needs of a student
- Developed based on data collected during pre-assessments and formative assessments
- Tasks can be done with teacher assistance, in a group setting, or individually

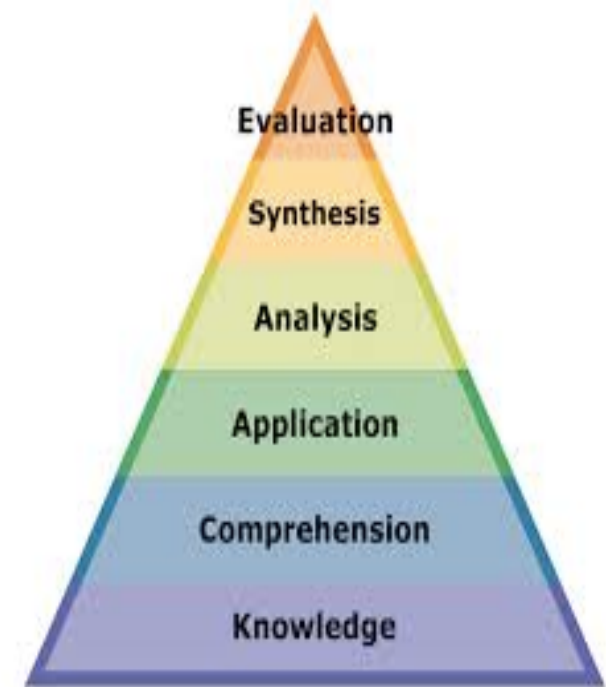
+ Tiered Activities cont'd.

- There are no set number of tiers – depends on the classroom and the varying abilities
- Provide students with challenges that fit their cognitive development and are within their ZPD (Dixon-Krauss, 1996)
- When creating a tiered unit use Bloom's taxonomy
- Bloom's taxonomy is a continuum of thinking levels that increase in difficulty



+ Bloom's Taxonomy

- Struggling students' tasks will be targeted toward least complex levels of Bloom's taxonomy
 - Knowledge: recall of information
 - Tasks include requiring students to recall, explain summarize, list, define, memorize, name, fill in, or find information
 - Comprehension: students who have a basic understanding of material
 - Tasks include locating, identifying, describing, review, discuss, restate, rewrite, review, or paraphrase



Heacox, 2002

+ Bloom's Taxonomy cont'd.

- Students who have a basic understanding will have tiered tasks targeted toward the application and analysis level of Bloom's Taxonomy
- Application: Use what they have learned
 - Tasks should demonstrate, record, use, practice, research, calculate, operate, organize, translate, sequence, order, model, adapt, or interpret
- Analysis: Examine what you have learned
 - Tasks should compare/contrast, classify, categorize, solve, critique, examine, distinguish, experiment, question, infer, or investigate

Heacox, 2002

+ Bloom's Taxonomy cont'd.

- Students who have shown mastery of the content will complete assignments that are in the evaluation and synthesis levels of Bloom's Taxonomy
 - Evaluation: Determine the value
 - Tasks include: judge, predict, verify, assess, justify, value, choose, estimate, prioritize, or decide
 - Synthesis: Put learning together in a new way
 - Tasks include: compose, hypothesize, create, design, develop, produce, transform, or invent

ADDENDUM # 3 : Tiered Unit – Find or Create a Recipe

(X – 1) & (X – 2) on following pages

X – 2 – REMEMBER

From a grocery flyer provide student with a problem that deals with adding, subtracting, multiplication of decimals along with problems that include tax.

X – 1 – COMPREHENSION

With recipe given and costs provided, calculate the cost of your meal including taxes.

X – APPLICATION

Find a recipe and figure out what items you need to purchase. Look through the flyers provided and determine the cost of each item. How much would it cost to make your favorite meal including taxes?

X + 1 - ANALYSIS

Find or create a recipe and figure out what items you need to purchase. Choose two grocery stores and create an itemized list for each item and determine which grocery store is most cost effective.

X + 2 – EVALUATION

Find or create a recipe. Estimate a budget for your favorite meal. Use several different grocery store flyers to find the most cost effective prices for each item and determine whether you were able to stick to your estimated budget. Explain whether your budget was realistic, why or why not?

Tiered activity completed in EDPI 654

X – 1

RECIPE: Chicken Stir Fry

Find the cost of the following recipe: (taxes are already included for each item)

boneless, skinless chicken breast	\$7.99
Garlic	\$0.79
Onion	\$3.00
Broccoli	\$ 1.99
Bell Peppers	\$ 3.49
Carrots	\$ 2.99
Ginger	\$ 0.99
Noodles	\$ 2.00
FOR TERIYAKI SAUCE:	
Vegetable oil	\$5.99
Soy Sauce	\$2.50
Ketchup	\$4.99
Vinegar	\$4.49
Pepper	\$1.99

Completed in EDPI 654

X – 2



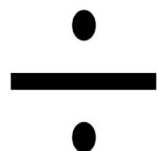
You want to make breakfast and need eggs and bread. At IGA, this week, eggs cost \$3.99 and bread costs \$3.49. How much will it cost to make breakfast?



I have \$15.25 to buy snacks. I want to buy kettle chips for \$2.50, yogurt for \$4.48, and granola bars for \$5.97. How much money will I have left over after I buy my snacks?



Miss.Simrin and Miss.Catherine want to buy cupcakes for their classroom. There are 21 students in the grade 6 class and each cupcake cost \$2.25. How much do your teachers have to spend to get every student a cupcake?



A box of 8 Danone yogurts cost \$7.00. How much would it cost for each yogurt?

+ Eight Steps in Creating a Tiered Unit

- Step 1: Choose grade level and subject area.
- Step 2: In line with the QEP criteria and standards
- Step 3: Goal of the unit and determine what skills students should have at the end of the unit
- Step 4: Develop pre-assessments
- Step 5: Consider what to tier – content, process, or product
- Step 6: Consider whether to tier by readiness, learning profile or interest
- Step 7: Determine how many tiers are needed
- Step 8: Types of formative and summative assessments needed

Pierce & Adams, 2004

+ Today's Task

- Turn to the UbD that you started to develop during the last workshop
- We had completed Step 1 and 2
- Today we will be focusing on Step 3
- We will be planning the learning experiences and instruction



+ UbD – Step 3

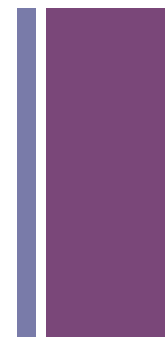
- Determine an entry point – how are you going to hook your students and grab their attention
 - Show a video, dress up, provide analogies, experiment, create a scene etc.
- Think about what experiences will help students develop the necessary knowledge and skills needed by the end of the unit
- How will they explore the essential questions?
- How will you make students reflect on their work? How will you use formative assessments to check in with students?
- What form of student self-evaluation will you use?
- Make sure you differentiate by learning profile, readiness, and interest throughout your unit

+ UbD – Step 3 cont'd.

- At this point you need to think about the sequence of your unit
- How can you order your lessons to maximize learning?



+ Fill in this Section of UbD



Learning Plan (Step 3) – include ongoing assessments ideas

Pre-Assessment	
Entry Point	
Tiered Activity	
Recoding new information Formative Assessment	
Student Self-Evaluation	
Differentiate by learning profile AND interest	
Organization and Sequence	

+ Creating a Tiered Unit

- In your group of two create a tiered activity for your unit plan.
- Use the template in your package



+ Homework

- Develop a lesson that includes learning profile, interest, and readiness
 - Examples of this would be a
 - 2-5-8
 - Tic-Tac-Toe
 - Choice Boards



+ References

- All references can be found in the literature review.

Until Next Time...



"Some believe that differentiation takes more time. However, it helps you use your time more efficiently."



The DI Approach: Pathways to Student Success

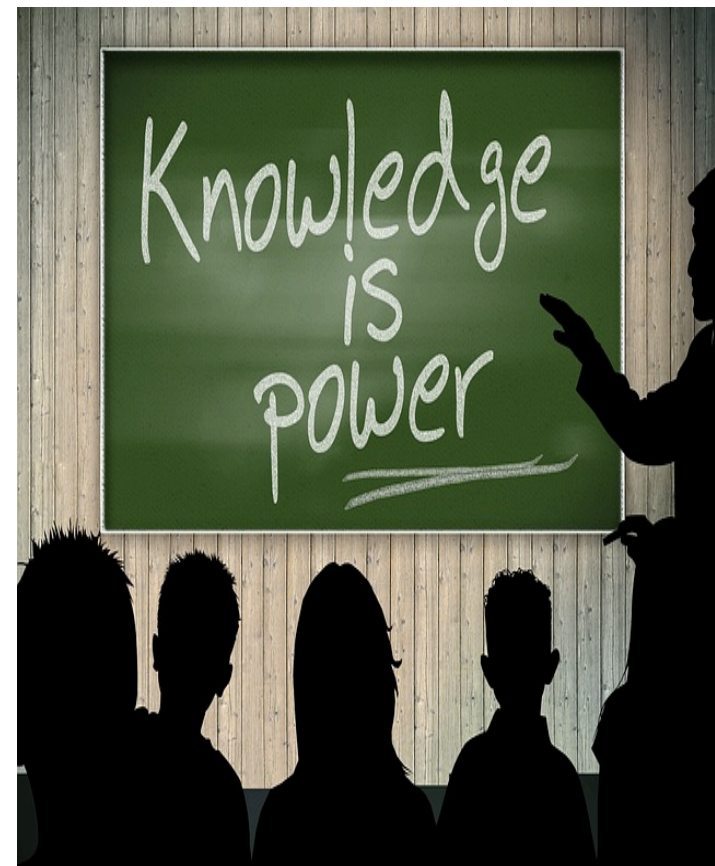


Learning Environment & Understanding the Brain

Simrin Aulakh & Catherine Meloche

+ What are we doing Today?

- Creating a healthy classroom
- The physical set-up of the classroom
- Tips for classroom management
- Instructional Strategies for Management
- Understanding the Brain
- Informational Processing Model
- Working Memory
- Long-term Storage



+ Let's Talk



Look at this
classroom:

- What do you see?
- Can you relate?
- How do you think the students feel?
- What kind of teaching and learning is conducive in this environment?

+ Let's Talk cont'd.



- Look at this classroom:
- What do you see?
- Can you relate?
- How do you think the students feel?
- What kind of teaching and learning is conducive in this environment?

+ Implementing DI

- One of the major barriers in regard to DI is implementation and teachers comfort levels
- Teachers struggle with the definition of DI and what it means to differentiate
- They fear how to manage DI efficiently
- They fear how to maintain control of student behaviour
- Teachers are reluctant to new ideas

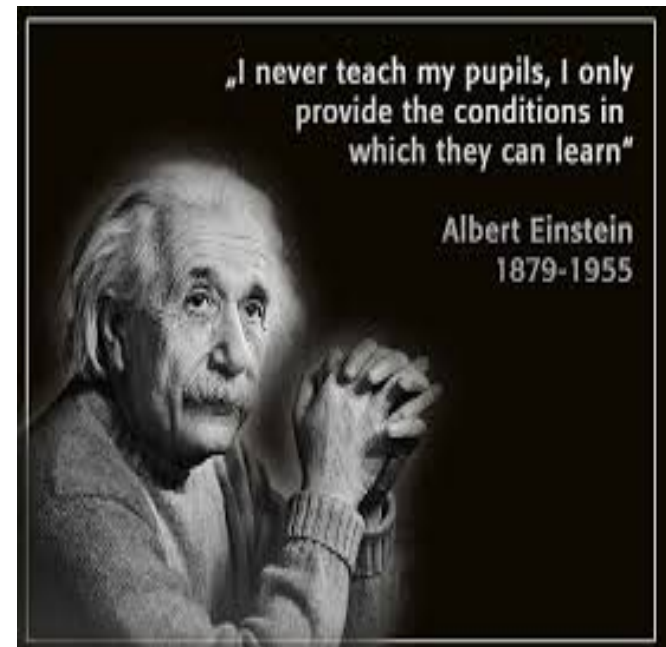


+ Creating a Healthy Classroom

- The first step in building a healthy classroom is getting to know your students
- This can be done with pre-assessments, games, and ice breakers at the beginning of the year.

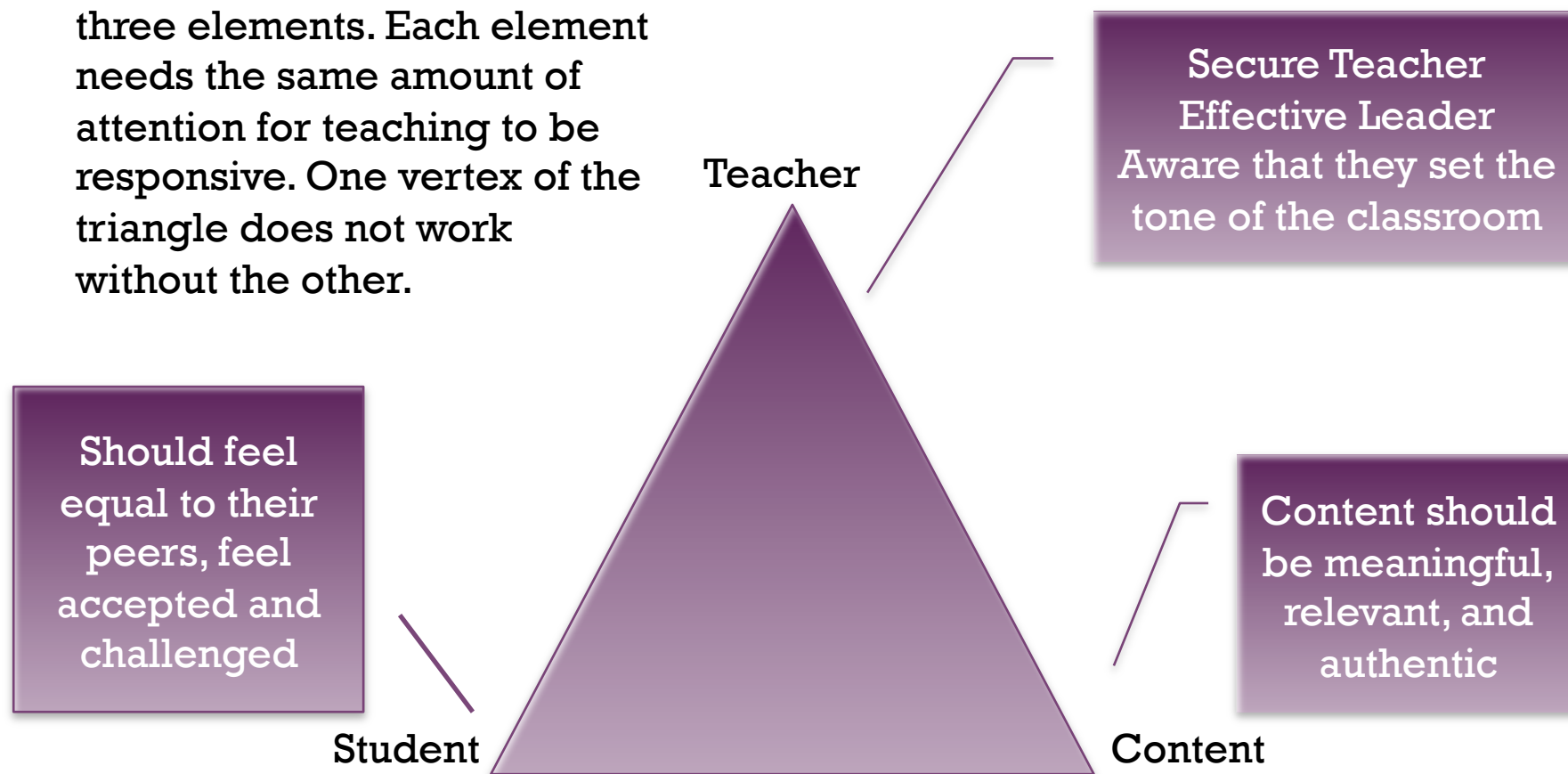
“Until that human feels safe, until that human feels a sense of belonging, energies cannot go to learning” (Tomlinson, 2003, p. 15).

- A healthy classroom means building positive relationships with your students



+ Healthy Classroom

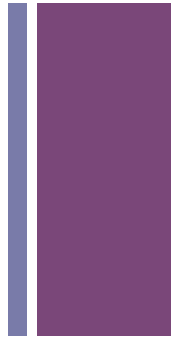
A healthy classroom has three elements. Each element needs the same amount of attention for teaching to be responsive. One vertex of the triangle does not work without the other.



Tomlinson, 1999

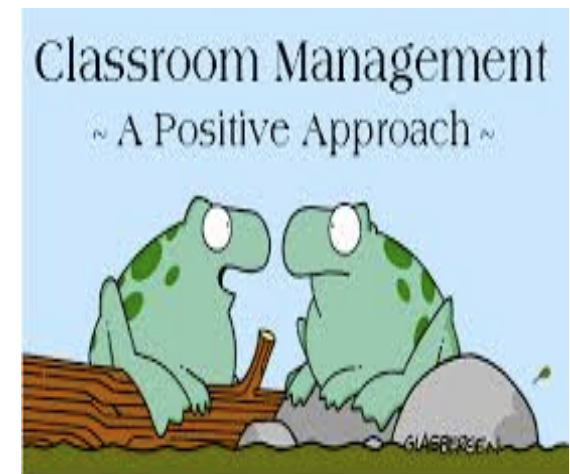
+ Let's Get Physical

- Draw or describe the current physical set up of your classroom
- Share your models or descriptions with a partner
- Discuss the positive and negative elements of your classroom



+ A Positive Classroom

- When students are involved in their learning = more self-regulated learning and develops more meaningful learning
- Young (2005)
 - Positive interaction, feedback, and clear expectations increases motivation and the use of metacognitive strategies
- De Anda (2007)
 - Teachers need to create an environment in which students can question without being judged
 - Give up authoritarian role
 - Develop reciprocal conversation
- Students benefit from a classroom where they receive support and are challenged at their level



"Looks aren't everything. It's what's inside you that really matters. A biology teacher told me that."

+ An Effective Learning Environment

- Santangelo & Tomlinson (2012) stated an effective DI classroom:
 - Need classroom routines
 - Need procedures
 - A physical set-up that supports DI
 - Flexibility with content, time, space
- Physical set-up is important
 - A traditional classroom can have negative effects on learning (Burke & Burke-Samide, 2004)
 - Proper lighting, noise, temperature are factors that effect the environment



+ Classroom Management

- Essential to have proper classroom management skills.
- When classroom management is not effective, unnecessary time is spent dealing with behaviour rather than instruction (Tricario & Yendel-Hoppey, 2012).



+ Tips for Classroom Management

Heacox, (2002):

- Be organized
- Plan ahead
- Separate material in bins according to learning levels
- Prepare groups in advance
- Have a place for finished work
- Set up classroom in groups
- Develop a transition routine
- Provide students with clear expectations for behaviour, assignment, and noise level
- Set aside time student-teacher time and rules about disruptions during one-on-one time



+ Your Classroom

- Let's Discuss!
- Ideally how would you set up your classroom?
- What elements could you change to better facilitate DI?
- Do you have any extra tips for your fellow teachers?



+ Sponge Activity



- Activities that fill in the gaps during teaching time – ideal for early finishers, interruptions, or during transition times
- Re-focuses student – gives student a break
- Managing a sponge activity
 - Decide when they are needed
 - Build a collection of activities that cater toward one of the following: movement, relaxation, taking turns, listening, following directions
 - Activities should be based on students' interests
 - Fits the needs of the students
 - Examples of sponge activities: take a walk, stretch, provide free time, play a game
 - Set a timer for sponge activities

+ Anchor Activities

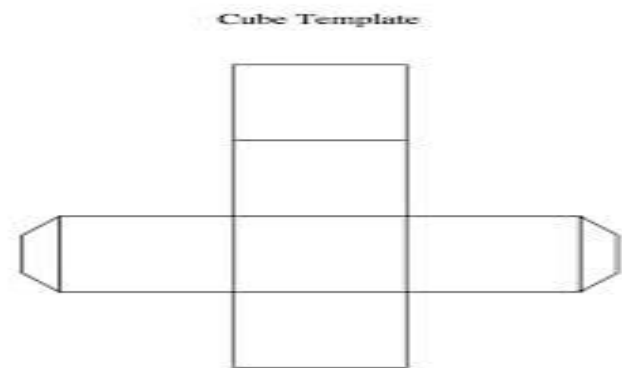
- Allows early finishers to do an activity that is anchored in the current subject matter
 - Reinforce and extend unit skills
 - Leads to independent learners
 - Give teachers one-on-one time to work without being disrupted
- Teachers should
 - List extension activities in a visible place
 - Make sure they are aligned with skills needed for the unit
 - Make sure activities are motivating
 - Explain directions prior to activity
 - Implement routines for anchor activities
 - Reinforce that it is a privilege early finishers



Chapman & King, 2008

+ Cubing

- Organizational method used to challenge
- There are six options that all fit with the unit
- The student rolls the cube and does the assignment that is rolled to the top of the cube.
- Benefits:
 - Various levels of challenge
 - Engaging
 - You never know what you're going to get
 - Flexible



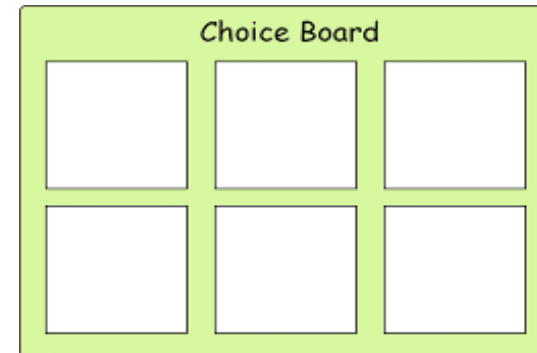
- Teacher should:
 - Reference board in the classroom with all options
 - Students are allowed to roll a second time if the first activity does not peak their interest
 - Decide if the cubing activity is individual, done in partners, or in groups
 - Can create alternatives to a cube such as a spinner, a mystery number etc.

Chapman & King, 2008

+ Choice Boards

- Provides a list of activities
- Completed independently with little guidance
- Linked to the unit skills
- Designed to meet varied needs
- Benefits:
 - Providing choice gives students ownership of learning
 - More engaged
 - Students produce more when they have choice

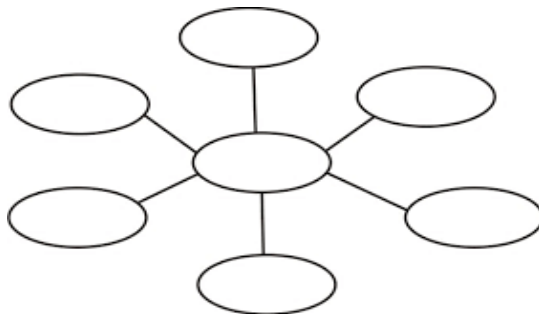
Chapman & King, 2008



- Managing:
 - Can be individual, in partners, or in groups
 - Provides activities that are tailored to readiness, learning profiles, and interest
 - Organize choice boards for different levels
 - Ex: Even numbered choices are for advanced students. Odd numbered choices are for struggling learners.

+ Graphic Organizers

- Used to help students organize and put information into categories
- Geared toward visual learners
- Type of organizer depends on the type of information
- Identify the purpose of using the organizer



- Benefits:
 - Creates a road map of where you want to go
 - Good for brainstorming
 - Good for note-taking
 - Helps planning out a writing task
- Managing:
 - Needs to be taught
 - Teacher need to model how to use it
 - Use it across subject matters
 - Practice skills in small groups or individually
 - Allow for students to choose the organizer
 - Have access to a variety of organizers

+ Centres

Chapman & King, 2008

- Student-centred activity
- Provides practical application
- Allows for re-teaching and extension
- Provides students with opportunity to practice skills
- Benefits
 - Improves critical thinking
 - Increases ownership
 - Opportunity for informal observations



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graphics © www.thefairyprint.com

- Managing:
 - Provide students with clear expectations and rules
 - Be consistent with demands
 - Begin slowly
 - Students need constant practice working in centers
 - Increase demands and the number of centers with each exposure
 - Materials should be easily accessible
 - Be flexible – if a center is not working - adjust or close

+ Academic Contracts

- Contract for independent study
- Usually for students who are at a mastery level and need a challenge
- Teacher and student both have to agree
- Time frame

Signature

- Benefits
 - Maximizes time
 - Keeps students engaged
 - Extends learning
 - Enriches learning
- Managing
 - Conference with student
 - Determine how to keep track and assess student progress
 - Create a rubric
 - Provide time for students to work on the project
 - Set a timeline

+ Let's Sponge!

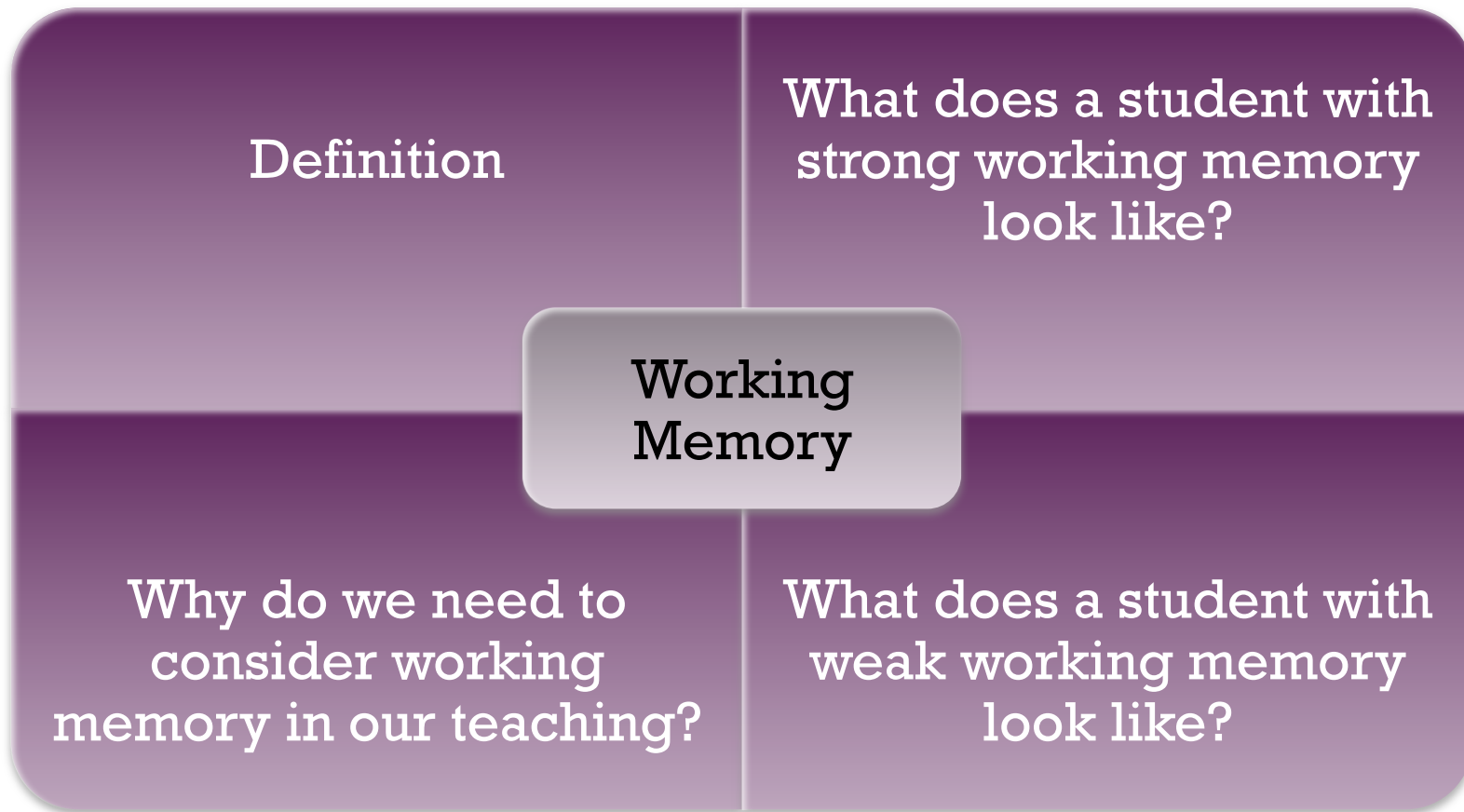
- Let's do a sponge activity to get the oxygen flowing!
- Four corners:
 - Each corner has a number assigned to it
 - One volunteer will come up and cover their eyes
 - The rest of the group chooses whatever corner they want to stand in
 - The volunteer chooses one corner to send back to their seats
 - The remaining players run to a different corner of the room – any corner they choose
 - The volunteer chooses another or the same corner to eliminate and so and so forth
 - The object of the games is to eliminate the most people as quickly as possible
 - The game should take 5 minutes
 - It's a great way to provide students with an opportunity for movement and a fun way to reinforce following directions





Fayer Diagram

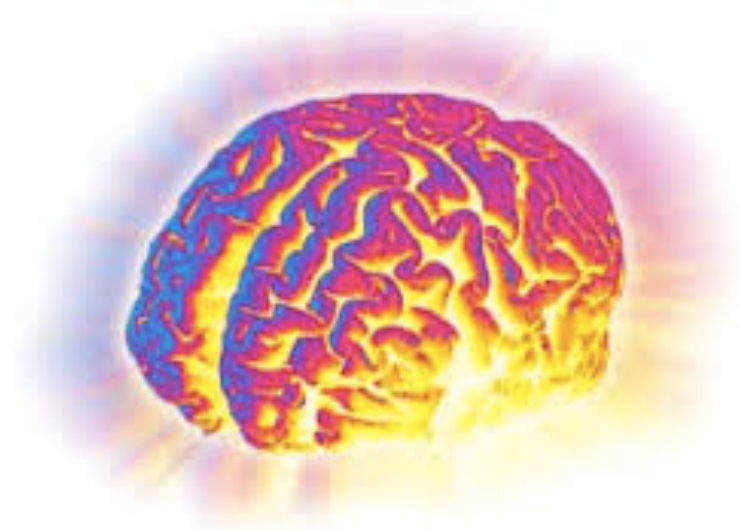
Let's do this one together!



Adapted from Tomlinson & Moon, 2013

+ Understanding the Brain

- Learning is a natural process of the brain
- (Gregory, 2005) The brain learns when
 - Information is useful
 - Information is interesting
 - Challenge is appropriate

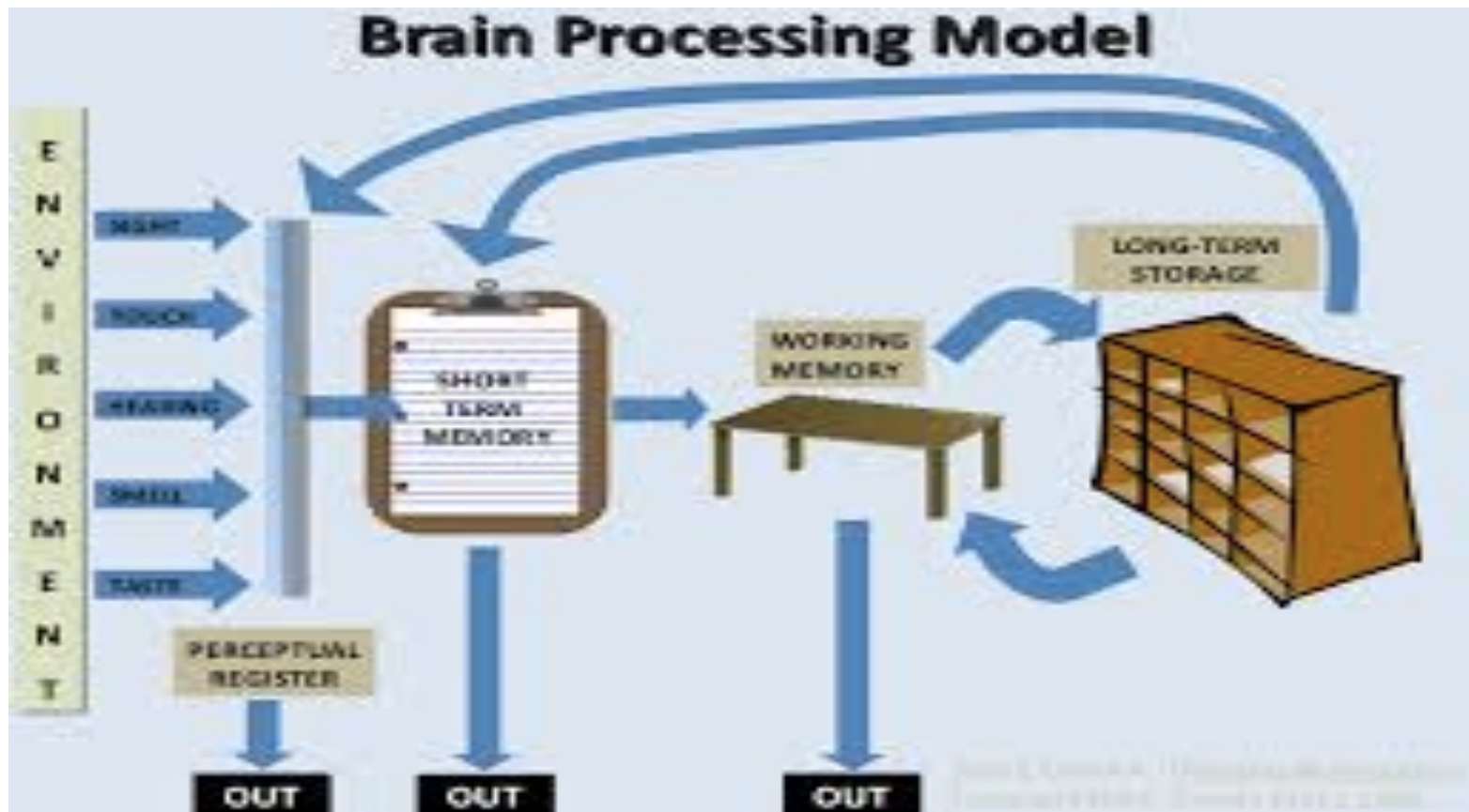


+ Understanding the Brain cont'd

- Children's brains create neural connections at a faster rate than adults
- At puberty, the rate begins to slow
- Elementary and early childhood education teachers have crucial role



+ Information Processing Model



+ Information Processing Model

- Model designed to help teachers understand the brain
- The brain's primary role is to ensure survival
- Information enters the brain through the senses
- Sensory register filters information pertinent to survival and previous experiences
- If a threat is perceived, it gets processed immediately and shuts down all other processes
- Emotions are given high priority
 - Both negative and positive emotions strengthen memory
- Kids need to feel safe physically and psychologically in order for learning to occur



Sousa, 2006; Gregory, 2005

+ Working Memory

- Working memory is used for
 - Active processing
 - Acts as temporary storage for new information
 - Build on, break down, and re-formulate concepts
- Working memory
 - Has a limited capacity
 - Capacity increases over childhood
- Average adult brain can hold 7 items
 - That is why we can easily remember phone numbers



Sousa, 2006

+ Table

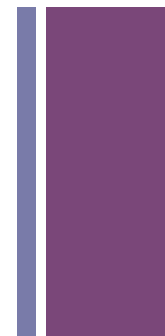


Table 1

Changes in Capacity of Working Memory with Age*

Approximate Age Range in Years	Capacity of Working Memory in Number of Chunks		
	Minimum	Maximum	Average
Younger than 5	1	3	2
Between 5 and 14	3	7	5
14 and over	5	9	7

*Note: Table 1 is adapted from Sousa (2006), Table 2.1, p. 46

+ Implications for the Classroom

- By not exceeding working memory capacity there is a higher likelihood that students will retain information
- Instruction should be provided in chunks
 - This optimizes working memory and transfer
- Most pre-adolescents can attend for 5-10mins before they check out
 - To maintain focus, change, or manipulate the way information is presented
 - When a topic is interesting or motivating an individual can stay focused for several hours
- You should have shorter and more frequent lessons, rather 40 minute lesson plans

Sousa, 2006

+ Long-Term Storage

- For information to be stored long term it has to be either meaningful or fit into a student's previous experience and their understanding of the world
- If information has both these elements it increases transfer
- For information to move from working memory to long-term storage it takes 18 -24 hours
 - Teachers should check in the next day to assess recall
- Teachers can increase retention by creating connections between and across subject matters



Sousa, 2006

+ Long-term Storage cont'd.

- Long-term storage acts as a filing cabinet holding past experiences and knowledge
- That filing cabinet makes up our cognitive belief system
- Cognitive belief system is an individual's world view
- Teachers need to understand that although students share similar experiences their interpretation may be vastly different
- Self-concept is part of this system
 - Can be positive or negative
 - Previous experiences can affect attitudes toward a future task
 - Example: A student who is avoidant because of previous failures should be given opportunities to experience success. This can be done by providing tasks that are within or just below their ZPD which will allow them to slowly build up their self-concept.

+ Your Take Away



- As teachers we need to understand how working memory affects learning
- Struggling students have a hard time excluding extraneous information
- In Reading (Frey & Fisher, 2010):
 - Until a student becomes a fluent reader their working memory cannot focus on comprehension because it's too busy decoding
 - When a student is fluent in reading it frees up the working memory space to focus on comprehension
 - Modeling, demonstrating, and thinking aloud strategies are effective in helping struggling and non-struggling readers to develop reading comprehension strategies

+ Your Take Away cont'd.

- In Math (Swanson & Beebe-Frankenberger, 2004)
 - Strong relationship between working memory and problem solving
 - Kids with working memory issues have a hard time eliminating extra information as the problems become more complex



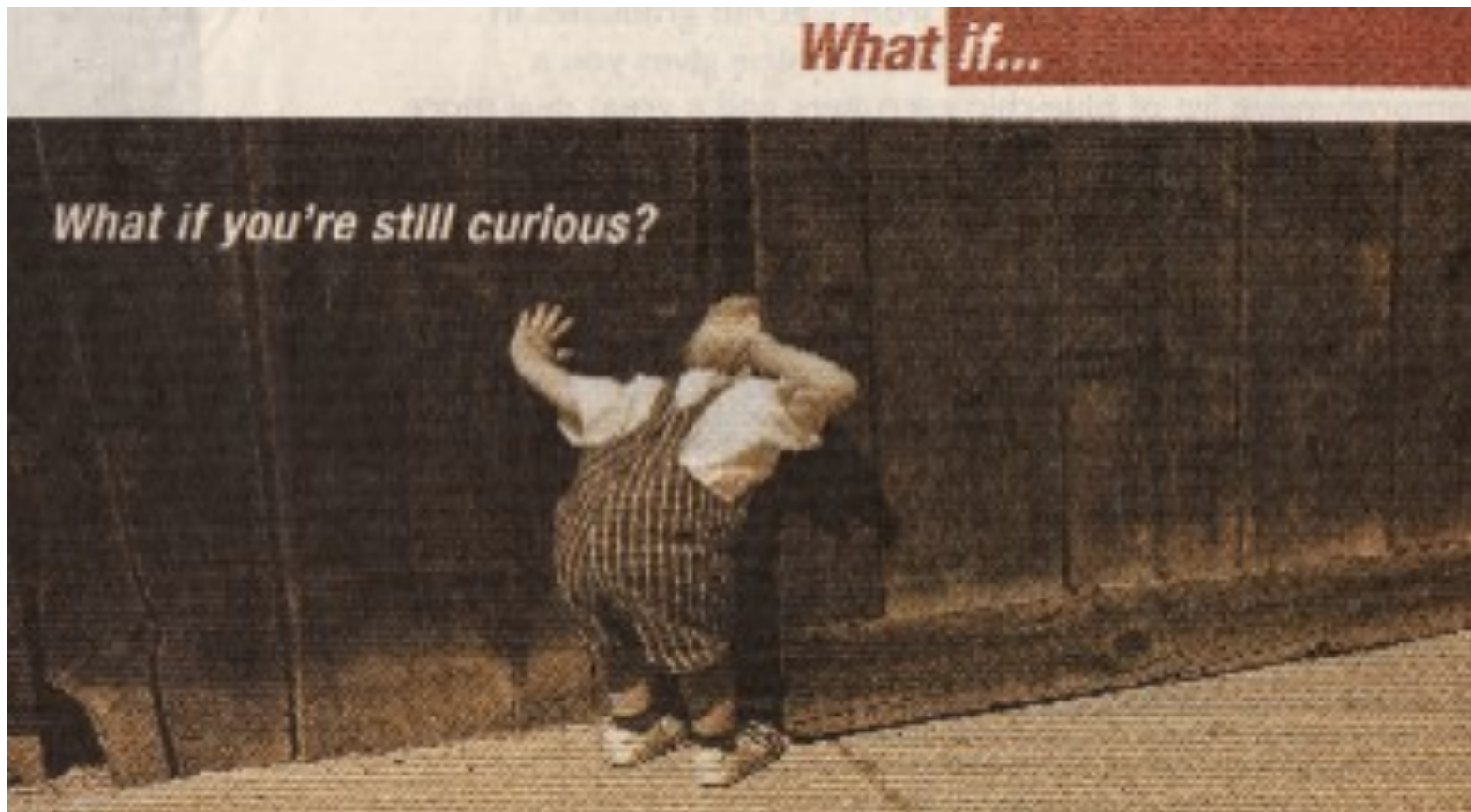
Adapted from Tomlinson &
Moon, 2013

+ 3-2-1 Activity

- Identify 3 new facts your learned about the brain?
- Identify 2 ways this information will help you in your classroom?
- Identify 1 question you still have?



+ We are Around for Questions!



+ Journal Entry

- As this our last workshop we would like you to take the opportunity to reflect on our time together.
- In what ways did this workshop series change your teaching?
- If you have implemented any of the strategies from this workshop, have you noticed any changes in your students? Explain.
- Has this workshop helped you feel more comfortable implementing a DI approach?
- We welcome your feedback on how to improve this workshop series for future teachers!



+ References

Chapman, C., & King, R. (2008). *Differentiated instructional management: Work smarter not harder*. Thousand Oaks, CA: Corwin Press.

- All other references can be found in the literature review.

Just like learning, differentiation
is a process. Take it one step at
a time!!

**"You're off to Great Places!
Today is your day!
Your mountain is waiting,
So... get on your way!"**
Dr. Seuss

**"Do not train a child to learn
by force or harshness; but direct
them to it by what amuses their
minds, so that you may be better
able to discover with accuracy
the peculiar bent of the genius
of each."**

- Plato