THE EFFECT OF TEACHERS' USE OF DEVELOPMENTAL PROFILING TO GUIDE INSTRUCTION IN TWO AT-RISK SCHOOLS ON STUDENT ACHIEVEMENT AS MEASURED BY MAP ASSESSMENT: TOWARD A MODEL FOR PROFESSIONAL DEVELOPMENT

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Abstract

Demands upon the time and attention of teachers in the fast-paced and multifaceted environment of today's public school classrooms often work to the detriment of student learning and achievement. Teachers who must respond to new curriculum models, team planning, parents, administrative requirements, etc. may find their only solace in the familiarity of repeating lesson plans, instructional approaches, and even their own words. When this happens, the teacher has taken the first step in a series of decisions that may lead to mediocrity and decreased student learning and achievement. Teachers must always respect the individual differences of students in their classes and the instructional implications thereof. Teachers who take the time to understand these characteristics about each individual in their classes and who use this information to guide their instruction, will find their teaching to be more student-centered and effective at increasing learning and achievement. Students whose teachers used the developmental profiling approach described here exhibited achievement gains of between 195% and 256% of expected.

This paper is presented in four parts.

1. Introduction to the developmental profiling concept and a review of supporting literature.
2. Description of the developmental profiling process used by teachers in this study.
3. Aggregated achievement results attained by 3rd -6th grade teachers in low-performing schools measured with the Measures of Academic Progress standardized assessment who used the developmental profiling process described in the second section.
4. A model to guide professional development of teachers.

Keywords: Teacher education, inservice training, student achievement, standardized testing

1   INTRODUCTION TO DEVELOPMENTAL PROFILING

Of all the factors affecting student learning and achievement in classrooms, only selection and implementation of instructional strategies are typically under the complete control of the teacher. Given this, teachers should be equipped to make the best instructional choices possible. Best practice in teaching results from thoughtful combination of a clear understanding about student development, the academic and pedagogical demands of required curriculum, and extant learning environments. That is, theoretical information from the fields of educational psychology and human development may be employed to accurately arrive at a multifaceted developmental profile for a student. This profile may then be used in combination with curriculum and environmental factors to identify and prescribe instructional approaches to the student that increase student achievement.

Personalization of curriculum and teaching are not new. In fact, most teachers already either purposely or intuitively adjust their instruction based upon various student characteristics – most notably - prior experiences and knowledge. Teaching in today's classrooms is a more complex and demanding task than it ever has been. With the advent of team planning and instruction, prescribed curriculum and instructional models, and many other pressures, teachers are tempted to respond by grasping for the most immediate resources without "doing their homework" on their own students. When seeking to identify what to teach, teachers tend to consult textbooks, the internet, grade-level teammates,

curriculum standards documents, and local experts, etc. Resources like lesson ideas from the internet, available professionals from the community, and others may be convenient, but the wise teacher considers the audience first, then fits the presentation to them. Results of this study indicate that teachers who take the extra time to know their students and then teach them accordingly, save time because appropriately and carefully crafted instruction results in students retaining more information from instruction.

2   LITERATURE

2.1   Not all the same

Discoveries about how we think, process information, act, make decisions, and live our lives also have implications for how we learn. By considering the ways students are different, teachers may arrive at the best ways to teach them both individually and in groups. This means that with a little diagnostic work, a teacher or parent can understand who a student is, what makes them unique, and how best to maximize the learning process. A teacher's theoretical knowledge about a specific child's development coupled with her/his skilled practical application of that knowledge to the child's learning environment has great potential to benefit the child.

Children differ from one another along several developmental axes. Researchers and educational theorists such as Piaget (1976), Bronfenbrenner (2004), Erikson (1950), Kohlberg (1976), Sternberg (2002), Gardner (1983), and others have identified and defined many areas of development and cognition related to the teaching and learning process that can be measured. Effective teachers recognize, respect, and incorporate these differences into their instruction to maximize student learning. To succeed, teachers must diagnose salient student development characteristics and implement instruction that maximizes student achievement.

The value of identifying individual differences between students followed by integration of the attendant instructional implications into teaching has recently gained strength as a foundation for fundamentally good teaching practice. To date, much research has been conducted identifying differences between children and how these differences may be accommodated in the classroom. Child developmental theorists and educational psychologists have identified and delineated measurable differences between children: (a) in their abilities to think and process information (Klahr & MacWhitney, 1998; Piaget, 1969, 1976); (b) in their preferences for learning modalities (Armstrong, 1993, 1994; Dunn, 1984; Gardner, 1983); and (c) in the ways they relate to one another (Erikson, 1963).

If children are different from one another, then a "one-size-fits-all" instructional approach is unlikely to be the most effective way to teach them. Rather, an approach to instruction that is reflective of the proclivities and capabilities of the students may be more effective. Bredekamp (1987) articulated this thought when she coined the term, developmentally appropriate practice. This notion constitutes a strong recognition that curriculum and instruction should be organized and implemented in ways that reflect and respect children's development. Tomlinson (2000) subsequently expanded upon Bredekamp's work by suggesting that any attempt to adjust teaching to the needs of learners falls under the topic, differentiation of instruction. Differentiation has gained wide acceptance as a concept that encompasses the spirit and vision of Bredekamp's work while extending the scope to include all age levels for instruction.

2.2   Effective teachers respond to student uniqueness

Much has been said about the characteristics of effective teachers and effective instruction. There are many commonly-held beliefs about the characteristics of clear and focused teaching. Among those is the belief that teachers take note of learning preference differences among students, and, when feasible, identify and use learning strategies and materials that are appropriate to different preferences. Also reported are several specific points supporting the use of relevant and varied instructional strategies (Bain, Lintz, and Word, 1989; Brophy and Good, 1986; Corno and Snow, 1986; Dunn, 1984; Metcalf and Cruickshank, 1991; Slavin, 1994; Wang, Haertel and Walberg, 1993/1994).

Individual differences between students are important content in teacher training. Practically speaking, the content areas of educational psychology and child developmental theory, common in both undergraduate and graduate teacher training programs, represent a body of knowledge to which nearly all teachers have been exposed. These bodies of knowledge emphasize differences in both the rates and ways in which children develop. By using this information, children's development may be quantified and appropriate instructional strategies may be selected. It seems logical that if instructional strategies indicated by the results of diagnostic activities are thoughtfully applied by skilled teachers, academic achievement will increase. Conversely, if teachers employ a one-size-fits-all approach to teaching, and do not consider the uniqueness of their students as they plan and implement instruction, student achievement will be unlikely to change.

3   USING DEVELOPMENTAL PROFILING

The following discussion presents each of the steps necessary for a useful developmental profile of a class of students. There is not sufficient room herein to address the specific activities to use with students or the specific instructional implications of the various potential findings related to the profiling process. More specific information about diagnostic activities and instructional implications of findings may be found in the book, *Using what we know: A practical approach to increasing student achievement* (Smith, 2009.) Because the profiling process cannot be divorced from grade and developmental levels, for the purpose of demonstration, the following steps will describe a profiling scenario with a 4th-grade class.

3.1   Curriculum Analysis

The first step in this process is for the teacher to analyze carefully the nature and depth of the content to be taught. The curriculum standard in Fig. 1 presents several key pieces of information vital to this analysis and subsequent instructional planning. Sources of curriculum are varied; standards, goals, and objectives all contain key terminology that informs teachers about curricular expectations. Consider the following curriculum standard from the 4th-grade South Carolina Social Studies Academic Standards (South Carolina State Department of Education, 2005, p. 3) and a related performance indicator.

South Carolina Social Studies Grade 4	**Standard 2**: The student will demonstrate an understanding of the settlement of North America by Native Americans, Europeans, and African Americans and the interactions among these peoples.
	Indicator 2.1 Use the land bridge theory to summarize and illustrate the spread of Native American populations. (G, H)

Figure 1: South Carolina (United States) Social Studies Sample Standard and Indicator

In the standard above, use of the word "*understanding"* identifies the type of content in this standard to be cognitive (rather than affective or psychomotor). The word "*demonstrate"* tells the teacher that specific performance expectations will follow in the indicators section. In the case of the indicator listed above, the word *demonstrate* is refined by the terms "*summarize"* and "*illustrate.*" Taken together, these terms direct the teacher to go beyond the level of knowledge in Bloom's taxonomy (Bloom *et. al.*, 1956), teaching and assessing the content at the comprehension level.

3.2   Diagnostic Process With Students

Once the teacher has characterized and understood the nature of the content to be taught, s/he must then work to understand the characteristics and preferences of the content recipient; the student. The next step in this process is to gather developmental and learning preference information from and about the students in the class. This example presents a fictional class of fourth graders who are studying social studies in South Carolina (United States.)

3.2.1 Multiple Intelligences Profile

The diagnostic process of students begins with development of an individual/class multiple intelligences profile. Steps to be taken by the teacher for development of this profile are:
1. Identify a multiple intelligences inventory (many are available free of charge from the Internet) and prepare it for distribution to students;
2. Administer the inventory;
3. Tally the results;
4. Develop a profile of each student by graphing the numerical results from the inventory;
5. Develop an aggregate profile of the class using the primary, secondary, and tertiary intelligences reported by each student (the intelligences that ranked highest, second to highest, and third);
6. Identify a primary set of instructional strategies to facilitate the majority of the learning preferences in the class;
7. Identify secondary set of instructional strategies to be used in small group settings as follow-up to the primary instruction;
8. Identify students who will benefit from neither of the above and plan individual instruction for them based upon their learning preferences.

Table 1 depicts a table of multiple intelligences data that has been weighted to exaggerate differences between each of the levels of intelligence reported by students, and then tallied to give an overall score representing the relative strength of each intelligence in the class. These will be considered to be the learning preferences of the class.

Table 1: Sample Multiple Intelligences Data

	Total	Primary	Secondary	Tertiary
Linguistic	45	5	6	2
Logical-Mathematical	22	3	2	1
Musical	64	8	7	3
Spatial	22	1	5	2
Bodily-Kinesthetic	80	10	8	6
Intrapersonal	3	0	0	3
Interpersonal	24	3	1	6
Naturalist	8	0	1	5
Existentialist	2	0	0	2

Fig. 2 is a graph of the data in Table 1 showing the relative strength of each intelligence in the sample. Note that there is no numerical scale on the graph. The purpose of the graph is to demonstrate the relative strength and presence of the intelligences in the classroom, thus the specific numbers from which the table is derived are superfluous. The graph clearly indicates this class will benefit from instructional approaches that emphasize the primary (bodily-kinesthetic) and secondary (musical) intelligences. These should be the centerpieces of large group instruction. Proper large-group instruction with this class will include allowances for students to move about or at least be physically engaged at their seats. Also important, based upon this class' profile, is the integration of strategies supporting musical intelligence. The second level of instructional implications is for small groups. In these groups, the tertiary intelligence should be emphasized; in this case, linguistic.

At this point, the teacher should analyze individual student data to determine which students have not yet received instruction according to any of their primary or secondary intelligences. These are the students whose instructional needs must be met via individualized instruction. For example, if one of the students in the class described above has logical-mathematical as a primary intelligence with naturalist and interpersonal as secondary and tertiary intelligences, then his or her needs have not been specifically addressed by any of the instruction that has been done with either large or small groups.

The teacher must plan individual approaches that will focus on this student's needs and will then need to see that the student receives appropriate instruction either individually or via some other approach.
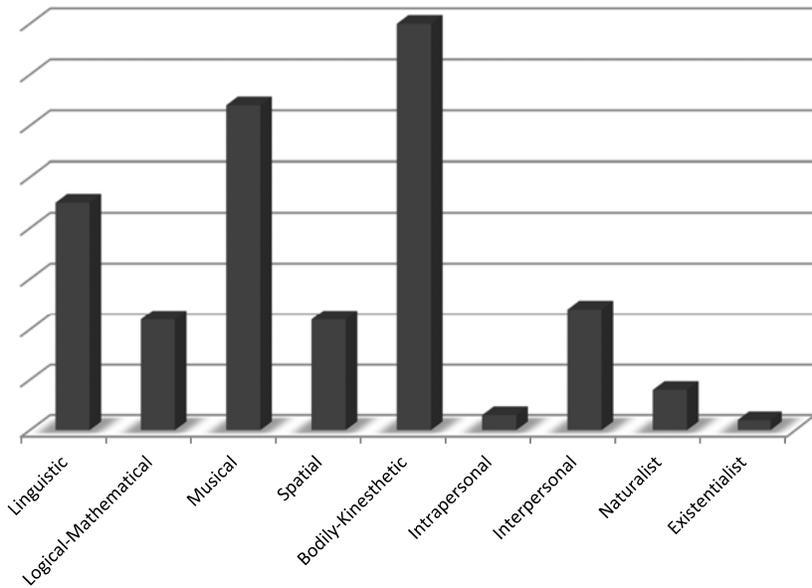
Figure 2: Relative Presence of Multiple Intelligences in Fictional Fourth Grade Class

3.2.2   Cognitive Developmental Profile

The next step is to create a profile of the students according to their cognitive levels. Fig. 3 shows a possible cognitive developmental profile of the class. Because the typical age range of fourth graders is 8-10 years, and in Piaget's (1969) theory of cognitive development, the identified age range for children who are capable of concrete operations is 7-11 years, it seems reasonable to expect that all fourth graders should be concrete operational. This is not so. In the same way that a teacher must accommodate a variety of learning preferences (multiple intelligences) with this class, the teacher must also identify and accommodate varying cognitive developmental differences between students.
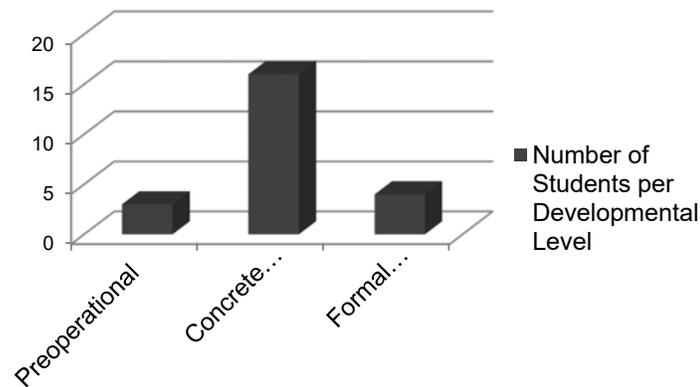
Figure 3: Cognitive Developmental Level Distribution in Fictional Fourth Grade Class

Because the class cognitive profile represented in Fig.3 shows that most of the students in the class are concrete operational (15 students out of 20), large group instruction should be predominantly

focused on concrete operational strategies like hands-on learning, use of manipulatives, and so on. Small group instruction should be transitional; beginning with concrete strategies, but moving into more abstract learning activities. Preoperational students will require individual attention and should be included in planning when the teacher is considering large group and individual instruction. By anticipating which students will need one-to-one attention, the teacher can decide whether classmates may be able to assist/scaffold the preoperational learners or whether the situation calls for the teacher to scaffold learning.

3.2.3   Ecological Backdrop to Instruction

Ecological information about the class comes into play when the teacher is planning the context of lesson presentation. Consider the information in the following list of characteristics discovered by interviewing the fictional class.
- 20 students have siblings.
- 15 students live with mother and father, 5 live in single parent homes, and 3 live with grandparents.
- 9 students say they play recreational football.
- 2 students say they are gymnasts.
- 17 students say they attend religious activities.
- 3 students live at/below the poverty level.
- After school hours, children said they play at home or go visit a relative or friend.
- 4 students live in homes in which English is their second language.
- 4 students have severe speech difficulties (not related to the item above).
- 1 student is autistic with moderate language problems.

Given this information, when the teacher introduces new content or senses a lack of understanding, s/he should draw upon information about which she knows the students have prior knowledge to forge connections to the content for students. For example, for the class with the above ecological profile, word problems in mathematics may become more relevant if presented in terms related to football or gymnastics scores. Another implication might be that because there are three class members who live below the poverty line, the teacher should consider that assumptions about prior experiences for these students may not be accurate. If the teacher anticipates that learning of certain content will only happen if preceded by related experiences, the teacher may have to facilitate children's learning by providing the relevant experiences for children. After that, the critical content may be addressed.

3.2.4   Psychosocial Characteristics

Psychosocial information about the class gives insight about why students interact with each other and the teacher in the way they do. This information should be used to guide teacher-student interactions. This is especially important to the teacher in a multiage classroom. Students usually have reasons for their behaviors that make perfect sense to them, but those reasons may not be normative in the adult world. It is incumbent upon the teacher to understand each student's psychosocial development and to facilitate her/his growth toward adult rules and norms for behavior and interaction.

Because the stages of Erikson's theory of psychosocial development (1950) encompass broad age spans, unlike the other diagnostic profiles, the psychosocial profile of a class may be accomplished by identifying the ages of the students in the classroom and accepting the tenets of Erikson's theory as applicable. In the fictional fourth grade class, the students are between eight and ten years old. This puts them in the "Industry versus Inferiority" stage. There will be times when the age range of students in a class will not be so neatly bounded by one stage within Erikson's theory as the hypothetical class described here. When the profile of a class spans two or more psychosocial stages, each student will require attention to her/his specific stage. While this individualized approach to understanding the needs of students may seem potentially time-intensive, the benefit of improved teacher-student relationships tends to compensate by producing a more efficient instructional environment where students feel emotionally confident, thus, are better behaved.

3.3   Plan and Implement Instruction

Once the developmental profiles have been built and analyzed, the teacher is adequately equipped to plan instruction. The teacher may now combine all the information gathered about the students to create maximally effective lessons that are truly student-centered, developmentally responsive, and achievement- oriented. Fig. 4 depicts the principle of triangulation as it relates to instructional practice.

Figure 4: Model for Triangulation of Classroom Practice (Smith, 2009)
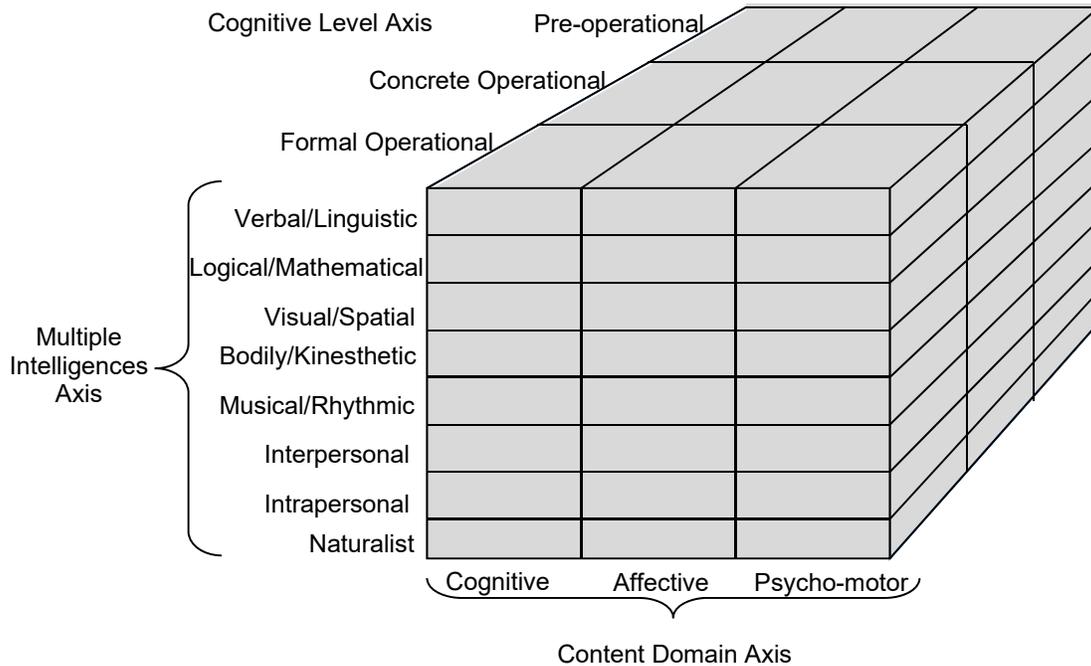
Picture the cube in Fig. 4 to be a series of boxes stacked beside and upon each other. Each box has an address defined by its membership on the axes around the outside. For example, the uppermost right box is at the intersection the preoperational, verbal/linguistic, and psycho-motor axes. The contents of the box (not listed because of space limitation) would contain a list of instructional strategies appropriate to that combination of characteristics. For example, as students are learning about letters that protrude above and below lines when they are correctly formed, the teacher might tell students to spell words chorally doing the following:

- clap above their heads on the letters that stick up above the middle (dashed) line,
- clap in front of them for letters that neither protrude above nor below, and
- clap below their waist for letters that protrude below the line.

By teaching students in ways they learn best, learning increases. As learning and confidence increase, achievement will increase (Bandura, 1986; Smith, 2009). Student-centered, developmentally-responsive, and achievement-oriented instruction begins with knowing both the student and the curriculum, and it can only be achieved by teachers who become adept at developmentally diagnosing, accurately prescribing, and implementing appropriate instruction.

4   RESULTS FROM THE USE OF DEVELOPMENTAL PROFILING IN TWO FAILING SCHOOLS AS MEASURED BY M.A.P. STANDARDIZED ACHIEVEMENT INSTRUMENT

The diagnostic-prescriptive approach described above was implemented in two failing schools in South Carolina (United States) with students in grades 3-6. Treatment effect (increase in student achievement over anticipated) was measured using student gains in scores from pre to post test administrations of the Measures of Academic Progress (MAP) instrument; a nationally standardized and commonly used

achievement test for benchmarking student academic progress in grades 2 - 10 published and maintained by the Northwest Evaluation Association (NWEA, 2010). The test is administered electronically via computers in school computer labs with student scores then directly reported to school administrators. Administration of the test typically happens three times per school year; once in September, again in December or January, and finally in March or April. Data reported here reflect the first two administrations of the test in each school, fall (pretest) and winter (posttest.) Student gains from pre to posttest were compared with expected gains (NWEA, 2008). Students complete three content sections on the MAP; mathematics, reading, and language usage. Results of test are reported to schools and teachers by NWEA as both percentile and RIT scale scores. The RIT scale was derived using Danish mathematician, Georg Rasch's (1901 – 1980) Item Response Theory (NWEA, 2010.) Scale scores represent equal intervals of item difficulty, thus, increases in scale scores represent increases in student content mastery, herein referred to as achievement.

Table 2 presents expected and actual achievement gains resulting from implementation of the diagnostic process described in the sections above. Data were gathered via a pre-post test administration of the MAP instrument from September of 2008 to January of 2009.

Table 2
Achievement Increases from September 2008 to January 2009 for Grades 3-6 in Two Failing Schools in South Carolina (United States)

Grade	Expected / **Actual** Achievement Gains in RIT Scores			Percent Actual Gains are of Expected Gains by Grade Level
	Math	Reading	Language Usage	
3	5.9 / **8.8**	4.7 / **11**	5.4 / **11**	195.63%
4	3.6 / **9.4**	3.6 / **10.9**	3.9 / **8**	256.34%
5	4.3 / **8.7**	2.9 / **7.7**	3.0 / **5.6**	218.17%
6	3.1 / **4.6**	2.2 / **5.4**	2.3 / **5**	203.74%

Data in Table 2 indicate achievement gains in all grade levels of approximately 2 to 2.5 times the expected. Anecdotally, these results are similar to results obtained by teachers in grades 2-12 who implemented this diagnostic/prescriptive approach to instruction, however, because those results were achieved using teacher-constructed assessments for which no reliability and validity information is available, these data will not be reported here.
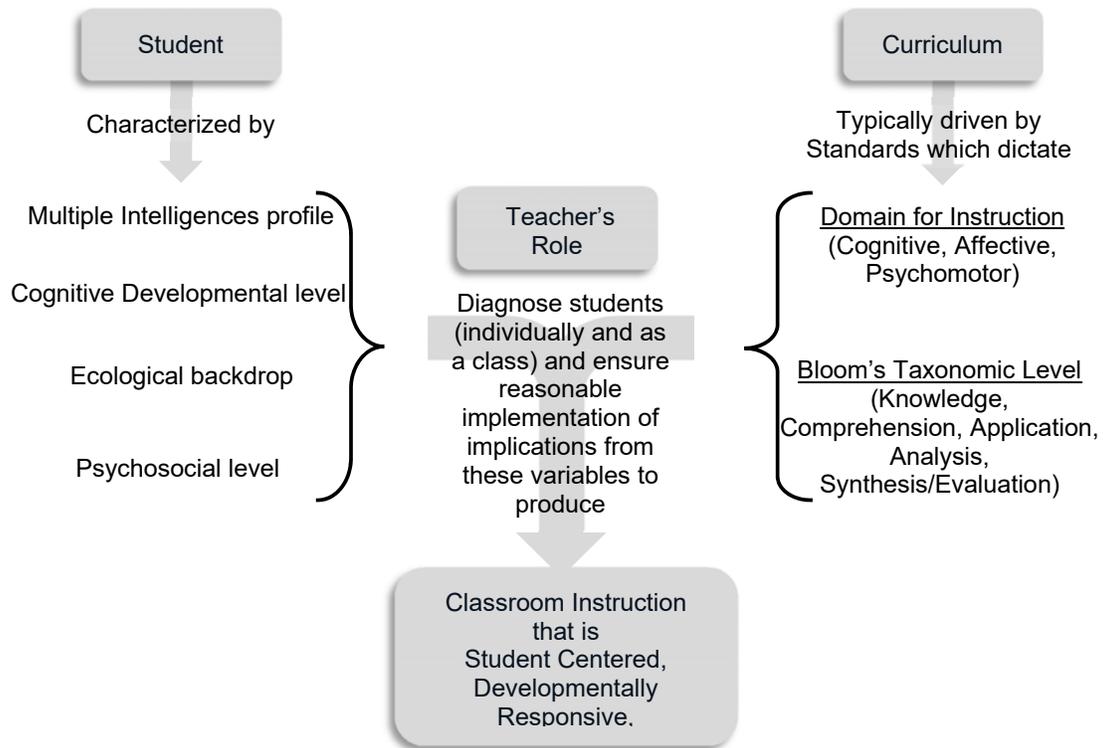
5   A MODEL FOR PROFESSIONAL DEVELOPMENT OF TEACHERS

Effective teaching that results in maximized student achievement is a complex and dynamic activity that defies simple definition or reduction to a set of simple ordered steps. In its most pure form, teaching is equal parts art and science. Evidence presented here suggest that teachers may improve their effectiveness at increasing student achievement by becoming knowledgeable about students' developmental needs and proclivities, and then by planning and implementing instruction accordingly. Although the artistic application of this information cannot be denied, improvement of the "science" part of teaching has promise as a target for professional development.

Effective teachers balance the forces and factors within their control with student-centered, developmentally-responsive, achievement-oriented instruction as their goal. Fig. 5 depicts some of the important forces and factors influencing effective classroom instruction. Note that each of the theories referenced on the left side of the graphic represent information that can be gathered by teachers about their students. The right side presents domains for content presentation and cognitive levels of understanding that must be attained by students. While all of these phenomena may be measured, ultimately, the teacher must analyze, balance, and produce instruction that is responsive to the combination of these classroom-based factors. By analyzing the degree to which the curriculum's nature, scope, and sequence are flexible teachers begin to understand the boundaries within which they must remain during instruction. Conversely, this analysis also provides the teacher with an understanding of the latitude with which they are able to interpret the curriculum. By analyzing the developmental profile of the students, teachers begin to understand the parameters that must guide

their instruction. By artfully combining these two sets of knowledge, the teacher may make informed decisions about instruction that will result in increased student achievement.

Professional development of teachers that is based upon this model would help teachers by empowering them to quantify and then implement instruction based upon their findings. This notion leaves the teacher as balancer of information and lends focus to and delivery of curriculum.

Figure 5: A Model for Balancing Classroom Instruction (Smith, 2009)

Professional development based upon the Model for Balancing Classroom Instruction (Fig. 5) should begin by understanding the needs of those who will be receiving the information. The first and second steps in professional development based upon this model are for teachers to understand the processes involved with developmental profiling and the appropriate use of information gathered via these processes. These principles and practices should guide the teacher in collection and compilation of developmental information, and then in use of that information to inform classroom instruction. In these two steps, the teacher identifies both strengths and limitations of the students. Hereafter, the teacher should consider this information first in all cases where these students are to be taught.

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