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The Devalued Student: Misalignment of Current Mathematics Knowledge and Level of Instruction

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Within this study, we investigated the association between 10th-grade students' mathematics performance and their feelings of instructional misalignment between their current mathematics knowledge and educator support. Data from the 2002 Education Longitudinal Study, which included a national sample of 750 public and private high schools in the United States, was used for the investigation. Our findings indicate that student perceptions of both instructional alignment and educator support are associated with mathematics performance. Students who reported receiving misaligned instruction in mathematics and felt devalued by educators had lower mathematics performance than students who reported aligned mathematics instruction and who felt valued by teachers. A key implication for practitioners of this work is that mathematics educators should consider cognitive and affective elements of student development. Specifically in addition to cognitive factors, the affective elements of student capacity to receive, respond to, and value whole-group mathematics instruction in academically diverse classrooms should be considered in curriculum planning.

> *Learning is not just the acquisition and manipulation of content; how and how well we learn is influenced by the affective realm – our emotions and feelings – as well as by the cognitive domain.* (Ferro, 1993, p. 25)

It is well known that not all students reach their full mathematics potential in high school. According to Tomlinson et

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al. (2003), one potentially important reason for this is a lack of instructional level alignment. In such cases, teachers fail to adjust their instruction effectively to accommodate academically diverse student abilities. If instruction does not accommodate students' varied readiness levels, students will have inequitable learning opportunities (Tomlinson et al., 2003). Instructional level alignment, in which instruction is given at a level that is beneficial to the student, depends upon aspects of the cognitive domain. Effective instruction that is aligned with a student's ability level in mathematics could lead to cognitive growth in the student's knowledge, comprehension, and critical thinking. Failure to align instruction in a way that may be beneficial to a given student could lead to a sense that the educational process does not value him or her. Feeling valued in an educational process is another important factor in students reaching their full potential and can be viewed as an affective domain. A key affective element would be a student's inability to respond to the misaligned instruction (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). For example, if a student is unable to understand a difficult mathematics class because it is at a level above their ability to respond to the instruction, the student may not progress to the affective level of valuing the instruction. The inability of the student to reach a valuing state could have substantial negative consequences and may cause the student to affectively shut down (Hackenberg, 2010). What is understood to a lesser degree is the impact that instructional level misalignment and not feeling valued in the educational process can have on high school students' mathematics success.

Further investigation of the potential impact of these two issues is needed to better understand instructional level alignment as it relates to school policy issues such as instructional level grouping (Paul, 2005) and whole-group or differentiated classroom delivery of instructional content (Lawrence-Brown, 2004). Instructional grouping is in part motivated to reduce student ability level diversity so more students will be aligned with the delivery of whole-group instruction. Differentiated instruction attempts to create different levels of instruction alignment for students' diverse ability levels within a group of learners (Lawrence-Brown, 2004).

To address this need to understand more about the role of the affective domain in mathematics education, we investigated the educational performance of 10th-grade mathematics students coupled with their perceived experience of instructional level alignment—based on their perceived ability to understand a difficult mathematics class—and their impression of not feeling valued by teachers. While a multitude of variables (including student and educational factors) may influence student success and engagement in academic settings, we focused on the direct interactivity between the students' mathematics performance and both their sense of being valued and their perception of understanding a difficult mathematics class.

Literature Review

Student Diversity

Although the diversity of students' current subject knowledge can be a challenge for teachers of mathematics, it is often a desired classroom characteristic (Kennedy, Fisher, Fontaine, & Martin-Holland, 2008). Diversity may be characterized by factors that include students' learning styles, gender, age (Bell, 2003), racial or ethnic backgrounds (Kennedy et al., 2008), life experience, personality, educational background (Freeman, Collier, Staniforth, & Smith, 2008), or current subject knowledge. For the purposes of the study, we were most concerned with students' reported perception of their ability to understand a difficult mathematics class. Furthermore, we feel that this factor is closely related to the other aspects of diversity mentioned above.

The Cognitive Domain

How students learn mathematics. Mathematics is an interconnected discipline comprised of different topical strands: number sense and operation, algebra, geometry, measurement, and data analysis and probability (National Council of Teachers of Mathematics [NCTM], 2000). According to the NCTM, a school mathematics curriculum should be coherent and organized in such a way that the important fundamental ideas form an integrated whole. Students need to be able to comprehend how ideas build upon and connect with other ideas. In mathematics, a student may understand new material when he or she can make connections with his or her existing mathematical knowledge. Those students with sufficient prerequisite mathematical knowledge are more likely to be able to build upon that knowledge and progress to a deeper understanding.

Research in cognitive learning theory, pioneered by such researchers as Piaget and Vygotsky, has provided valuable insights for mathematics educators concerning the ways in which children learn and understand mathematics (Fuson, 2009; Kilpatrick, 1992; Ojose, 2008). The work of Ojose (2008) is particularly important because he applied Piaget's four stages of cognitive development (sensorimotor, preoperational, concrete operational, and formal operational) directly to the mathematical development of children. He concluded that when students are grouped solely by chronological age, their developmental levels can vary drastically. Ojose emphasized the need for teachers to discover their students' current cognitive levels and adjust their mathematics teaching accordingly.

Vygotsky also provided insight into the development of cognitive learning theory and the understanding of how children learn mathematics. According to Vygotsky (as cited in Carter, 2005), learning happens when an individual is working within his or her *zone of proximal development* (ZPD). The ZPD is at a level above *independence*. Independence is defined as the stage where a student already knows the material and could perform that task without assistance. On the other hand, when material is in a student's ZPD, he or she is capable of performing tasks with help from a teacher or more able peer (Carter, 2005; Smith, 2009; Van de Walle & Lovin, 2006).

Whole-group instruction contributes to misalignment. In the dominant model of whole-group instruction, in which one teacher provides instruction to a group of students, educators often attempt to target a central prior knowledge level of the group. Furthermore, as stated by Tomlinson et al. (2003), organizational restraints restrict teachers from meeting the needs of students who "diverge markedly from the norm" (p. 120). This approach may be utilized for a variety of reasons and has been linked to the availability of faculty as well as increased class sizes (Ochsendorf, Boehncke, Sommerlad, & Kaufmann, 2006). Targeting a central ability level of a large group of students allows the instruction to be presented at a level that would facilitate effective learning for a majority of students in the group. For these students, the instruction is expected to be beneficial because it is at a level that their current knowledge can support. However, students near the ends of the spectrum of background knowledge may not benefit from instruction if it is above or below their ZPD, possibly causing them to disconnect from the learning process. The NCTM's (2000) Equity Principle maintains that *all* students should have the opportunity and support needed to learn mathematics with understanding. The principle states, "equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students" (p. 12).

When whole-group instruction is used, the unit of instruction is the group. The unit of instructional interest, however, is the student. This represents a mismatch of instructional unit versus learner unit. When this mismatch occurs, important elements of the instructional environment to consider are the variability of between-student current knowledge levels and the hierarchical and cumulative nature of the content.

Variability of between-student current knowledge. The goal of a successful educational experience is to form an alignment between instruction and the current knowledge of individual students. Atkinson, Churchill, Nishino, and Okada (2007) described alignment as a coordinated interaction. They asserted that learning should be aligned with the socio-cognitive environment. Using Atkinson's et al. (2007) proposition, one could then view alignment in the context of this work as coordinated interaction between the student and the instructor. This would imply coordination, which results in successful alignment, and has been described as "the novice and the expert functioning as a cross-cognitive organism—rather than as cognitive nomads involved in the same activity" (p. 177).

When an instructor is presenting content that is not aligned with the student's current knowledge level, the instructor and the student can be in different and unconnected cognitive locations. If instruction is beyond a student's ZPD, the student might perceive that he or she is unable to understand material or that the information is too difficult to comprehend. Conversely, when instruction is given below a student's current knowledge level, the curriculum does not challenge him or her, possibly leading to boredom and the risk of slipping into underachievement status.

The hierarchical and cumulative nature of mathematics. Instructional level misalignment is more likely when the nature of the content is hierarchical. Nonhierarchical subject content is where instructional learning units are based on the *knowledge* level associated with Bloom's Taxonomy of the Cognitive Domain. The goal of this type of instruction would be for the student to remember specific declarative or procedural facts (Bloom, et al., 1956; Hopkins, 1998). This recall requirement is the first stage in Bloom's Taxonomy of the Cognitive Domain and therefore the learner requires few knowledge prerequisites. In this type of learning, a student whose knowledge is less than that required by the current instruction level may be able to make substantial gains from the instruction. In contrast, learning requiring higher order abilities such as comprehension and analysis rests on the foundation of lower order knowledge and hence is more hierarchal (Booker, 2007). The hierarchical nature of mathematics learning, for example, may require mastery of basic skills to facilitate the attainment of higher order conceptual understanding (Siadat, Musial, & Sagher, 2008; Wu, 1999). In this case, successful learning of the current unit of instruction may require translation, interpretation, and extrapolation of previous learning units' material. In the absence of prerequisite knowledge, it is assumed that students will have difficulty transitioning to higher levels of learning and understanding within the subject.

The Affective Domain

The application of the levels of Bloom's cognitive domain of the educational taxonomy can be seen readily throughout education in the United States (Booker, 2007). The affective domain, however, has received less attention, and there is limited research on the affective learning of the student (Porter & Schick, 2003). Despite its lack of prevalence, a student's affective response to instruction might play a significant role in a student's interest in a given course. This is supported by Subban (2006), who found that students who enjoyed a task at an early age continued to seek the cognitive stimulation related to the task which helps even marginalized students in the classroom.

Categories of the affective domain. The affective domain of the Taxonomy of Educational Objectives includes the emotional engagement of the student with the topic and is linked inextricably to the cognitive domain (Krathwohl, Bloom, & Masia, 1964). The major categories of this domain are hierarchically organized from lowest to highest behavior processes. The first is *receiving* phenomena, which requires a learner's awareness of an idea and his or her willingness to acknowledge that idea (Maier-Lorentz, 1999). For example, a student busy texting during a mathematics class is unlikely to receive the teacher's definition of a mathematical idea. The next level is *responding*, which refers to the learner's ability to act on or respond to the idea they are receiving (Maier-Lorentz, 1999). A student that is in the responding state may be receiving and understanding the topic enough to be able to participate in a discussion or answer a teacher's question about the topic. It is here that we assert that students who are being exposed to instruction that is not aligned with their own current knowledge level can affectively disconnect from the learning process. This prevents them from reaching *valuing*, which is the next level in the affective domain. In the valuing state, a student may see worth in the learning even if the topic does not interest them (Deci, Vallerand, Pelletier, & Ryan, 1991). For example, they may be able to see where they can use their learning in their daily life or to get a better grade on an exam. On the other hand, those students who are unable to respond to a learning task due to a lack of alignment between the instructional level and current knowledge may start to become unwilling to consider new information. Thus, those who do not reach the valuing level in the affective domain because they were in a cognitively misaligned instructional experience may then feel that the teacher does not value them or that they are being *put down* (Krathwohl et al., 1964).

The transition from not being able to reach the valuing stage (Krathwohl et al., 1964) because of misaligned instruction to not feeling valued by a teacher can be viewed through the lens of self-determination theory (Deci & Ryan, 2000). A component of this theory is motivation, which can be related to valuing, competence, autonomy, and relatedness (Deci et al., 1991). In order for students to be motivated to see themselves as valued in the educational effort, they need to have some level of competency and autonomy of control of an outcome through some strategy for success (Deci et al., 1991). Competency and autonomy pertain to the student's ability to have some independent success at a task. An example of this might be that a student could self-initiate and self-regulate the undertaking and completion of a set of homework problems which were based on a teacher's effective instruction in that day's mathematics class. This is possible when a student has a sense of relatedness that pertains to a developed, secure, and satisfying connection to significant adults (Deci et al., 1991), such as mathematics teachers. We contend that if a student lacks relatedness to a teacher because of a misaligned instructional level educational interaction, which leaves the student without a feeling of competency or autonomy, the student may not be motivated to feel valued by the teacher. This connection between learning engagement and a sense of feeling valued by the teacher is also supported by Wentzel (1997).

A causal framework for the affective consequences of inaccessible misaligned instruction was presented by Boshier (1973), who described congruence and incongruence. He proposed that "when an individual is not threatened, and manifests intra-self and self/other congruence he is open to experience" (p. 260). The idea of intra-self and self/other congruence is related to the condition of harmony with self or with others. However, when an individual feels devalued or threatened, a condition of incongruence may occur. Incongruence of intra-self or self/other "leads to anxiety, which is a subjective state of uneasiness, discomfort, or unrest. Anxiety causes the individual to adopt defensive strategies which induce a closing of cognitive functioning to elements of experience" (p. 260). Receiving instruction above the level of a student's current knowledge can be viewed as a form of incongruence caused by instructional misalignment.

Engaging the affective domain in the learning of mathematics. Mathematics is a unique subject in the school curriculum because typically there is only one answer accepted to be correct (Chinn, 2009). Coupled with the cultural view that mathematics should be completed quickly, it could be argued that a student's willingness to learn mathematics involves taking a risk (Chinn, 2009). The fear of failure induced by risk taking is an affective dynamic that can cause anxiety, which may lead to low mathematics achievement (Chinn, 2009).

Hackenberg's (2010) work on *mathematical caring relations*

(MCRs) addresses the importance of involving the affective domain in the teaching and learning of mathematics. Hackenberg defines an MCR as "a quality interaction between a student and a teacher that conjoins affective and cognitive realms in the process of aiming for mathematical learning" (p. 237). In her study on MCRs, Hackenberg took on the dual role of teacher and researcher for four 6th-grade students. When Hackenberg posed problems that one of her students could not solve, she witnessed the emotional shutdown of the student. The interactions that took place to bring her student back to a state of operating put a heavy burden on not only the student but Hackenberg as well, demonstrating that MCRs include the needs of both teachers and students. When a student perceives his or her teacher as someone who understands, values, and challenges them with mathematical tasks within their ZPD, trust builds and he or she is more likely to take the risks that are involved in learning mathematics.

Purpose of Study

The purpose of the study was to assess the association of mathematics performance with students' feelings of being valued and their sense of instructional alignment. Specifically, we sought to answer whether there was an association between students' general feelings that teachers valued them and their standardized mathematics performance. We hypothesized that students who felt that teachers valued them would have higher scores in mathematics than students who felt that teachers did not value them. Secondly, we asked if there was an association between understanding a difficult mathematics class and students' feelings of being "put down" by teachers (devalued) in relation to standardized mathematics scores. We hypothesized that students who felt valued through instructor interest and perceived that the instruction was aligned with their knowledge (i.e., they were able to understand it) would demonstrate significantly higher performance in mathematics than students who did not.

Methods

Participants

The data for this study came from the National Center for Education Statistics (Bozick & Ingels, 2008; NCES, 2006) and resulted from the Education Longitudinal Study of 2002 (ELS:

2002/04). This study included a national sample of 750 public and private high schools and 17,590 10th-grade students and obtained 15,360 returned surveys, for a response rate of 87%. Of these 15,360 students, 14,540 had completed cognitive assessments in mathematics.

Instrument

Four variables were used from the ELS: 2002 base year instrument (*three independent variables and one dependent variable*). The dependent variable for both of the research questions was the standardized mathematics achievement score (Bozick & Ingels, 2008). The mathematics test standardized score was a T-score created by a transformation of the IRT (Item Response Theory) theta (ability) estimate from the cognitive assessments in ELS: 2002. The first research question's independent variable was: "teachers are interested in students." The independent variables for the second research questions were: "in class often feels put down by teachers" and "can understand difficult math class" (Bozick & Ingels, 2008).

Analysis

A one-way and a two-way analysis of variance (ANOVA) were used for the analysis. For the one-way ANOVA, the independent variable was derived from the statement, "Teachers are interested in students." Students choose from the following responses: *strongly agree, agree, disagree,* and *strongly disagree*. For the purpose of analysis, the options were collapsed into some form of agreement (*strongly agree, agree*) and some form of disagreement (*disagree, strongly disagree*). These options were then compared with the students' standardized mathematics score as the dependent variable.

For the two-way ANOVA, the dependent variable was the students' standardized mathematics scores. The independent variables were derived from the following two ELS: 2002 survey items: "In class often feels put down by teachers" and "can understand difficult math class." The options for the students in answering the item "in class often feels put down by teachers" were *strongly agree, agree, disagree,* and *strongly disagree*. For analysis, the options were collapsed into some form of agreement (*strongly agree, agree*) and some form of disagreement (*disagree,* *strongly disagree*). The options for the students in answering the question, "can understand difficult math class" were *almost never, sometimes, often,* and *almost always*. For the purpose of analysis, the options were collapsed into two groups. The first group of students responded with *almost never* or *sometimes*, and the second group responded with *often* or *almost always*. These two groups represented students who were likely to struggle or were not likely to struggle with mathematics instruction based on their current knowledge levels.

This collapsing of groups was informed by the ZPD as discussed by Tomlinson et al. (2003). We contend that a student that can often or almost always understand the instruction is effectively operating in the ZPD or at independence. A student that never or even sometimes understands the instruction is not operating in their ZPD and is not receiving effective instruction. Although we are not aware of any mathematics education research that attempts to quantify these categories, there is an example in the writing literature that does. Parker, McMaster, and Burns (2011) discuss operational levels for reading which were developed by Gickling and Armstrong (1978). If a student can read 97% or more of the words in a passage, they would be considered to be operating at independence. A student reading 93% to 97% is at a level at which reading instruction should take place, which represents the ZPD. A student reading below 93% of the words would be operating at a frustration level (Parker et al., 2011). We assert that a student that never or only sometimes understands difficult mathematics classes is operating at the frustration level, which is categorically different than operating in their ZPD or at independence.

Results

For our first research question we explored the association between students' general feelings that teachers were interested in them and standardized mathematics performance. The mean standardized mathematics score for students who had some form of agreement that teachers are interested in students was $M = 51.5$ ($n = 10{,}948$) and for students who indicated some form of disagreement was $M = 48.6$ ($n = 3{,}423$). This was found to be statistically significant, $F(1,\ 14{,}369) = 222.44$, $p < .05$, with a standardized effect size of $d = 0.29$.

For our second research question we explored the association between understanding a difficult mathematics class and students' feelings of being put down by teachers (devalued) in relation to standardized mathematics scores. The results of the second analysis indicated that both main effect factors of students feeling put down by teachers (devalued) and students feeling that they could understand difficult mathematics classes were associated with standardized mathematics scores. The means for these four conditions are shown in Table 1.

Table 1

Means for Two-way ANOVA for Feels Put Down by Teachers and Can Understand Difficult Math Class (MSE = 89.5)

In class often feels put down by teachers	**Can understand difficult math class**	***N***	***M***
Some form of agreement	Never, Sometimes	935	46.9
Some form of agreement	Often, Always	542	50.9
Some form of disagreement	Never, Sometimes	5,140	49.8
Some form of disagreement	Often, Always	4,399	55.1

The main effect for "in class often feels put down by teachers" was $M = 3.5$ with a standardized effect size of $d = 0.37$, $F(1,\ 11{,}012) = 165.2$, $p < .05$. The main effect for "can understand difficult math class" was $M = 4.6$ with a standardized effect size of *d* = 0.49, $F(1, 11{,}012) = 286.2$, $p < .05$. The interaction effect for "feels put down by teachers" and "can understand difficult math class" was $M = 1.5$ with a standardized effect size of $d = 0.15$, $F(1, 11{,}012) = 6.32$, $p < .05$. A plot of the means is shown in Figure 1. Strikingly, mathematics scores for those students who often "feel put down by teachers" were lower even if they often or always understood a difficult mathematics class.

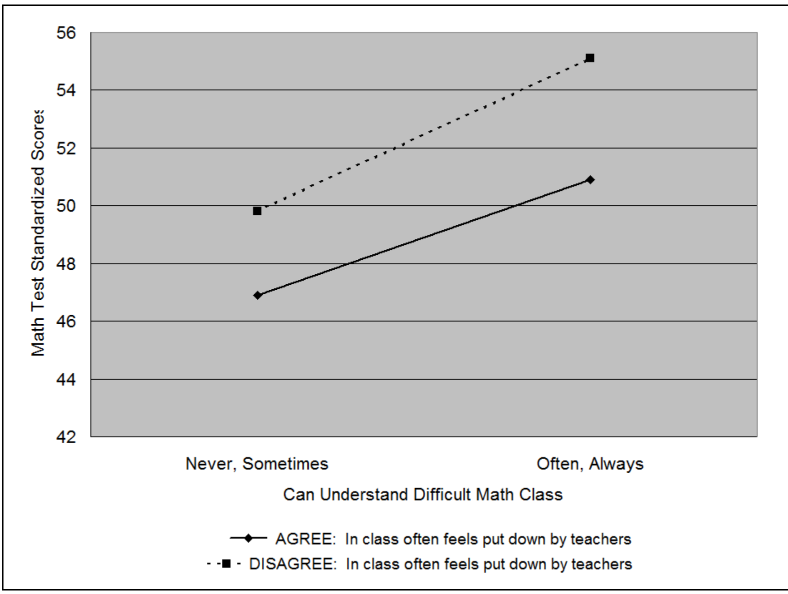

Figure 1. Interaction plot for the factors of "Can understand difficult math class" (never, sometimes or often, always) and "In class often feels put down by teachers" (some form of agreement or some form of disagreement).

As shown in Figure 1, students who performed the best (average math score of $M = 55.1$) indicated that they could often or always understand a difficult mathematics class and disagreed that they often feel "put down" by teachers. Students who performed the worst (average mathematics score of $M = 46.9$), indicated that they never or sometimes understand a difficult mathematics class and agreed that they often felt "put down" by teachers. The standardized effect size for this simple effect difference is $d = 0.87$. This difference represents a large effect (Cohen, 1988).

Discussion

Our findings revealed associations of students' ability to understand difficult mathematics classes and feeling devalued by teachers with standardized mathematics scores. Students who felt they were "often or always" put down (devalued) by teachers in class and "never or sometimes" could understand a difficult mathematics class had the overall lowest success in the standardized tests. This could be explained partially by Boshier's (1973) definition of congruence as an event in which students demonstrated greater likelihood of being open and accepting to new experiences in learning. A student who could not understand a mathematics class and felt put down by the teacher could experience a state of incongruence. Boshier's stance was similar to that of Krathwohl et al.'s (1964) affective category of *receiving* in which the student, through a sense of being devalued through not understanding a difficult mathematics class, does not accept the new learning content. Once a student drops out of the learning process, it can be difficult to bring him or her back, as Hackenberg (2010) experienced when the inability of her student to solve a variety of problems led to emotional shutdown.

To avoid students' perceptions of not understanding a difficult mathematics class and a sense of being put down, high quality instruction is necessary. Gamoran and Weinstein (1998) wrote, "conditions that support high-quality instruction in a heterogeneous context include small class sizes and extra resources that permit a highly individualized approach to instruction" (p. 385). According to Gamoran and Weinstein, resources that support individualized attention can lead to high-quality instruction. This is also a goal of reform-oriented mathematics teaching which embraces creating instruction aligned with current knowledge and abilities of students (Superfine, 2008).

While our findings indicate that only 11.8% (935/11,016) of the students from the analysis shown in Table 1 fell into the group that had the overall lowest success in mathematics (*in class often feels put down by teachers* and *cannot understand difficult math class*), we contend, with support from the NCTM's Equity Principle (2000), that is 11.8% too many. As stated by Chamberlin and Powers (2010), all students should participate in respectful work, and teachers should challenge students at a level attainable for them, which promotes individual growth. Whatever factors are associated with inhibiting a student's opportunity to meet the expectations set forth by the NCTM must be addressed in mathematics education literature and practice. The decisions made concerning mathematics curriculum and instruction in each educational system have important consequences for not only students but society as well. Furthermore, these decisions should not only deal with the cognitive aspects of the curriculum but the affective as well.

Lack of instructional level alignment and students' consequential feelings of being devalued by the educational process could also be an influential factor in achievement gaps. In a 2009 study, House found a correlation between Native American students' beliefs and attitudes towards learning mathematics and their score on the eighth-grade Trends in International Mathematics and Science Study (TIMSS) conducted in 2003. As one might suspect, those with positive self-beliefs about mathematics tended to score higher, whereas those with more negative self-beliefs scored lower. This illustrates how both the cognitive and affective state of the student could matter in mathematics education. A goal of the NCTM's (2000) Equity Principle is to increase students' beliefs about their ability to do mathematics. Clearly, this is a significant challenge, but essential to attaining equity in mathematics education.

Gregory, Skiba, and Noguera (2010) argued that disproportionate rates of disciplinary sanctions on minority children, which include exclusion from the classroom, could have a negative impact on student success. We contend that any substantial exclusion from a whole-group instruction mathematics classroom could be detrimental to the student's success. This is because the instruction would continue to progress without the student. Upon returning to the classroom, the student could face an even more misaligned instruction level; an occurrence that may enhance the likelihood of further disengagement and related consequences (Ireson & Hallam, 2001). The returning student's exposure to a misaligned level of instruction could lead to poor performance in the class and lower academic achievement. Choi (2007) found that academic performance was a significant predictor of delinquent behavior. This connection between poor achievement and behavior was supported by Miles and Stipek (2006) who found that poor literacy achievement in the early grades predicted high aggressive behavior in the later grades. A label of lower achievement implies that a student's knowledge is below the current unit of instruction, which is appropriate for the comparison instructional group. In essence, instructional level misalignment could potentially induce poor behavior that induces exclusion and produces even larger misalignment. Consequently, this may lead to an affective sense of devaluation by the student in the educational process.

It is imperative that educators continue to explore the influence of instructional level alignment on students' comprehension, emotional and cognitive well-being, and identification of being valued by the educational system. This proposition is congruent with Hallinan's (1994) assertion that there is a growing need for "rigorous empirical research on the effects of homogeneous and heterogeneous grouping in schools that vary in the several dimensions of school context to determine the impact of the organization of students on learning" (p. 91).

Testerman (1996) emphasized the need to consider the affective domain when working with high school students. We agree that the affective domain can no longer be ignored, and "schools must deal with the head and the heart" (para. 1). Our results lend support to Testerman's claims. Although more than 16 years have passed since Testerman's proposition, few studies have examined the connection between student achievement within the cognitive learning domain and the affective achievement domain.

Petrilli (2011) argues that the greatest current challenge to U.S. schools is the enormous variation in academic ability level of students in any given classroom. He states that some variation is good, but it is not uncommon to have variation in ability levels as high as six grade levels in one classroom. Whole-group instruction with this much ability level variability is likely to result in a sizable percentage of students who do not understand a difficult mathematics class and who possibly do not feel valued.

Overall, our findings support the integrative influence of cognition and affective processes in relation to 10th-grade mathematics performance. Results of this work support a need for educators to further examine instructional planning and the delivery of content to heterogeneous prior-knowledge-level groups of students. Minimally, we hope these findings will stimulate further conversation regarding student grouping policies, instructional practices (such as whole-group and differentiated instruction), and repercussions of those items in relation to a students' sense of understanding a difficult mathematics class and feeling valued by teachers within both the cognitive and affective domain.

Implication for Practice and Future Research

The best performance of this national sample of 10th-grade mathematics students was associated with students who could understand a difficult mathematics class and did not feel "put down" by their teachers. While student understanding and instructional alignment has long been considered a cognitive issue, this work demonstrates a possible link with mathematics performance and the affective domain. Further research involving qualitative methods may help make this link more clear and provide insight for practitioners as to what can be done differently in the classroom. Specifically, student interviews or focus groups could provide valuable insight about what leads students to feel "put down" by teachers and what contributes to feeling valued in the classroom. Within the structure of planning and implementing mathematics instruction, plans for improvement of both cognitive and affective domains should be considered by practitioners. We feel that at least the first three student affective components of receiving phenomena, responding to phenomena, and valuing (Krathwohl et al., 1964) should inform the design of mathematics instruction for all students.

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