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ABSTRACT

The "Taxonomy of Educational Objectives: II, Affective Domain," which was published in 1964, is examined. The study was undertaken to: (1) determine what alternatives to the idea of the process of internalization and the focus on values used in the taxonomy are suggested by present psychological theories; and (2) assess the implications of these alternatives for educational measurement. Examples are provided of theories that have been used in current research in mathematics teaching and learning. Cognitive, constructivist, and social interaction perspectives are outlined briefly; and domain-specific theories and research falling within the categories of directed cognition and intentionality are reviewed. Theories regarding intentionality include those addressing beliefs, motivations, and attributions. It is concluded that, at the outset, the idea of a structure underlying the affective domain was essential to the taxonomy. This internalization principle had a simplifying effect, although no single psychological theory can be found to cover the entire affective domain. It is argued that it is best to retain the psychological constructs that appear in active areas of research and incorporate them in subject matter and activity settings to link them to instructional planning. A 63-item list of references and four tables are included. (TJH)

From Taxonomy to constructing meaning in context: Revisiting the Taxonomy of Educational Objectives: II, Affective Domain, 25 years later

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I. Introduction: The Taxonomy

The Taxonomy of Educational Objectives: II, Affective Domain was published in 1964. The Taxonomy was part of an effort, started in 1948, by a group of psychologists interested in improving university examinations. The first volume of the series, the Cognitive Domain (Bloom, 1956), received wide use. The taxonomy used an organizing or ordering principle of complexity to structure the categories from Knowledge to Evaluation. The taxonomy had the effect of facilitating communication among researchers, teachers, and others involved in test construction and the setting of educational objectives. It stimulated the development of other item classification schemes as well, for example, the School Mathematics Study Group Project and the ETS scheme for categorizing math items.

The second volume, the Affective Domain, was published after some delay. The ordering principle used was that of internalization, with categories ranging from Receiving (Attending) to Characterization by a value or value complex. (Appendix 1 lists the major categories of each taxonomy.) This second volume had less effect on the testing and educational communities than the first. According to the authors (Krathwohl, Bloom, & Masia, 1964), the effort was delayed by several difficulties: lack of clarity in statements of affective objectives; the search for an ordering principle like that of complexity used for the cognitive domain; and a lack of interest by test developers in the affective area in relation to their on-going work. The authors also speculated on the reasons for the decline in interest in "affective objectives," and considered concerns such as using affective measures in grading (p. 17) and respect for privacy in attitudes, beliefs, interests and values.

We can speculate that the decline or lack of interest in such objectives may also have been due to the rise of a narrow view of behavioral objectives and a view that focused on a behavioral task analysis framework. The accountability and competency testing movements with their focus on basic subject matter skills as educational outcomes may also have reduced interest in the taxonomy. Another reason may have been the waning of the behavioral and positivistic views in psychological theory, without the emergence of a widelyaccepted alternative framework. Further, the general psychological theories of the time were not much concerned with the link of such theories into educational settings and teacher classroom activities.

Psychological theories and research directions have changed during the past 25 years, and it is time to reconsider the 1964 taxonomy. Alternative constructs and frameworks have emerged that may be useful to educational measurement specialists and to classroom teachers. In this paper we pose and discuss answers to two questions:

1. What do present psychological theories suggest as alternatives to the idea of the process of internalization and the focus on values used in the 1964 taxonomy? And,

2. What are the implications of these alternatives for educational measurement?

We examine first the changes in psychological theories and examples of the more domain-specific theories that are prevalent and related to the earlier Taxonomy. We include examples of these specific theories that have been used in current research in mathematics teaching and learning. Finally, we present implications for educational measurement in the form of a facet approach that draws on these domain specific theories. The facet approach is illustrated from an on-going research project. The purpose of this project is to develop assessment in two areas. The first is student-directed cognition--the metacognition and self-regulation that links cognition or thinking and intentionality. The second area is affect, broadly conceived to include intentionality or conation--those aspects of mental processes that include volition, desire and striving directed toward action and change on the part of the learner.

II. General Psychological Theory

Among the major changes noted in psychological perspectives are the shifts from views of learners as objects of change, with changes and learning iniciated from the outside, that is, learners as responders rather than intentional actors (Bower & Hilgard, 1981, p. 419, and discussion of cognitive learning psychology), to the view that learners are active constructors of meaning in a social interaction (e.g., Gardner, 1985; and Bruner, 1986, and the developmental cognitive/constructivist perspective). These changes have included speculating about the cognitive processes and strategies that are used by students in learning activities. Terms such as representation, schemas, executive processes, scripts, metacognitions, and similar constructs (e.g., Newell & Simon, 1972; Brown, 1978; Flavell, 1979; Chipman, Segal & Glaser, 1985) are used within models of information processing.

The cognitive view has also influenced behavioral perspectives in social learning theory (Bandura, 1986), and supported the study of beliefs as influences in the teaching and learning process (e.g.,Weiner, 1986). The influence of social interactions on learning was put forth again in the 1960s, with the publication of Vygotsky's Thought and language (1962, and see Wertsch, 1985). More recent analyses and proposals to examine the influence of culture or activity setting and social interactions on cognition are given, for example, by Goodenow (1987) and Wertsch (1985, ch. 8), and in the context of mathematics by Lave (1988), Saxe (1988), Stigler and Baranes (1988), and Cocking & Mestre(1988).

One other aspect of current research on teaching and learning that has implications for re-thinking the taxonomy is the shift of emphasis to working within the subject matter areas. Researchers interested in metacognition will focus their work on a specific subject such as reading or mathematics. Theories of expert-novice performance, for example, are currently researched in problem solving in mathematics (e.g., Schoenfeld, 1985, 1987). Applications of cognitive psychology in mathematics are evident in work such as that of Resnick and Ford (1981), Janvier (1987), Steffe and Cobb (1988), and to some degree in Skemp (1987).

There are guiding issues in such research in different areas of knowledge, and the research is presently thought to be influenced by the structure of the subject matter in which cognitive processes are studied. What Bruner has called "domain specific" theories are on the scene (1986, p. 149), both from the subject matter perspective and from that of the psychological processes or constructs being examined. The issue of the context dependence or content-free/content dependence of cognitive processes is not resolved (Glaser, 1985, Nickerson, 1988) for instruction and teaching, nor, indeed, is it resolved for motivational and belief constructs that are influences on learning, e.g., anxiety and math anxiety, efficacy and efficacy in mathematics. Similarly, descriptive research on teaching indicates different methods are used in different subject matters. For example, Stodolsky (1988) reported differences between social studies and mathematics classes in elementary schools.

To summarize, the cognitive, constructivist and social interaction perspectives are widely influential in general studies of psychological processes, and, increasingly in subject matter and content specific research. For our purposes here in relation to the affective taxonomy, we will examine next two threads of research:

1. research in an area that can be labelled "directed cognition;" and

2. research in an area that has been variously labelled "intentionality" or will.

In the earlier era of the taxonomies, aspects of the second area would have been encompassed within the "affective" domain. The area that we are calling directed cognition--metacognition and self-regulation--does not appear in the earlier Taxonomy of Educational Objectives: Cognitive Domain, and yet requires consideration in educational measurement due to the current emphasis it is receiving in cognitive psychology applied to educational settings. Directed cognition can be further viewed as an area that links cognition or thinking and intentionality.

III. Domain-specific theories

The domain-specific theories and research we examine here include constructs that fall within our categories of directed cognition and intentionality. Where research is available, we have included studies specific to the subject area of mathematics, since our example (below) is in the area of mathematics problem solving. These domain-specific theories provide alternatives to the 1964 affective taxonomy, expanding its focus on values and challenging the use of a single unifying construct, such as that of the process of internalization.

A. Directed cognition

Under the rubric of "directed cognition" we have included the cognitive processes called metacognition and self-regulation. Various writers categorize these processes differently, but here we have kept them separate for purposes of our work in mathematics. Metacognition refers to knowledge of the cognitive processes one uses while undertaking cognitive tasks (Flavell, 1976; Brown, 1978; Weinert & Kluwe, 1987). It can be considered to encompass awareness of one's cognitions or thoughts and strategies while working on an individual problem, such as a mathematics word problem, or striving for comprehension in reading or problem solving in other settings, such as science. General categories used in this self-monitoring of problem solving include planning and goal setting, monitoring progress, and evaluating. In mathematical problem solving, Schoenfeld (1985) describes competent problem solvers as those who consistently monitor and evaluate their solutions as they work, and he uses episodes or stages to study problem solving protocols: Read, analyze, explore, plan, implement and verify (1985, p. 294).

Self-regulation has received attention in a variety of psychological frameworks. In social learning theory, Bandura (most recently, 1986) proposed a cognitive view of self-regulatory behavior that included subprocesses of: self-observation; judgmental process; and self-reaction. Drawing on an information processing model, Corno and Mandinach proposed, "a sequence of learning activity called self-regulated learning"(1983, p.89). Components of self-regulated learning in this view were alertness, selectivity, connecting, planning, and monitoring, including self-checking. Meichenbaum (1978), in clinical studies of cognitively-oriented behavior modification, has also focused on strategies to help individuals control their own behaviors. In all of these frameworks, the strategies are generally used over larger segments of activities than solving an individual problem, thus self-regulation is used here as a category separate from metacognition, to indicate the individual's cognitively-directed processes in such educational activities as doing homework or taking a test.

In the example we present below, the meta cognitive and self-regulation processes have been grouped into three areas related to solving a problem or exhibiting aspects of self regulation in classroom activities. The three areas are:

1. Planning-before beginning a task or solving a problem, including defining objectives and setting goals;

2. During work, monitoring progress, keeping track;

3. After working, evaluating, judging what has been done and what needs to be done.

We used a fourth category, strategies, in the metacognitive classification. In the subject of mathematics, different strategies may be applied to particular problems and the use, or lack of use, of these strategies are of interest to teachers and students in math classrooms.

The metacognitive and self-regulatory cognitive processes are distinct from the outcomes of teaching and learning, as described in the earlier taxonomy in the cognitive domain. However, such processes are hypothesized to be influential in the outcomes. The use of these processes is also likely to be linkee with the domain that was included earlier in the affective taxonomy. Several psychologists have called attention to this interdependence in current cognitive perspectives on thinking (e.g., Corno & Mandinach, 1983; Nickerson, 1988; Paris, 1988; Snow & Farr, 1987; Weinert, 1987; see also McLeod, 1988; McLeod & Adams, in press). Paris provided a persuasive argument for the more direct view that the student's understanding of the value of a skill--memory strategies in his example, is influential in the plans or use of the skill. Thus the incorporation of current constructs from the motivational and beliefs area is appropriate for the expansion we propose here. We also note, as did the authors of the 1964 taxonomy, that there is a long history in psychology of analyzing the interrelationships of cognitive and affective behaviors (cf. Chapter 4, of the 1964 taxonomy, including the discussion of James' writings of 1890).

B. Intentionality

Included under the category of "intentionality" or "will" are psychological constructs which we have referred to as affective beliefs, motivations, and attributions. Affective beliefs refer here to four characteristics of a learner of mathematics: the perceived value or utility of a mathematically-related activity; interest in the task; confidence in doing the task; and anxiety or concern over doing a mathematically-related activity. Motivations include the perceived reasons for approaching the task, whether these originate from the individual's own goals for learning or from external sources. Attributions include beliefs about the causes for success or failure in mathematical activities, as well as those instances in which the individual feels no sense of control for learning or performance outcomes.

1. Beliefs

Value and Interests. Eccles (1983) suggests that the value a person places upon a task is a function of three components: the attainment value of the task, the intrinsic or interest value of the task, and the utility value of the task for future goals. In the context of learning mathematics, we have considered value and utility as one component, and defined it as the conviction that mathematics as a subject or particular topics within mathematics are useful, important or worthwhile (valuable). Fennema and Sherman (1976) included a scale to assess usefulness in their work on mathematics attitudes.

Interests can be defined as topics or subjects that hold the learner's attention or arouse feelings of curiosity, eagerness, liking or enjoyment. The negative aspects, that is disinterest, would be indicated by lack of curiousity, active disliking or boredom. While not often assessed outside of career and occupational instruments in the past, interest in subject areas and topics is of concern to classroom teachers and increasingly to researchers. Anderson, Shirey, Wilson and Fielding (1987) describe the interest of reading materials (capacity of materials to evoke a response in children) and its effect on enhancing recall. Measures of interest in mathematics have been included in models to predict math achievement and participation (e.g., Wise, 1985).

Confidence and Anxiety. Confidence can be defined as belief in one's own ability to do a task or learn a topic, for example, belief that one can successfully solve a mathematical problem. Measures of expectancies are related to achievement and intention to take mathematics courses (Eccles, 1983). Expectancies of success are measured in such scales as those developed by Fennema and Sherman (1976). Anxiety can be defined as a state of worry, uneasiness or fear about one's performance in a task or area of endeavor. Scales to measure anxiety are used in several areas of research, e.g., state and trait anxiety (Spielberger, 1977) and test anxiety (Hill, 1984; Sarason, 1980). In mathematics, the MARS, a measure of mathematics anxiety, has been developed (Suinn, Edie, Nicoletti, &

Spinelli, 1972). The Fennema-Sherman scales (1976) also include items to tap anxiety toward mathematics. Although it has been suggested that confidence and anxiety are opposite ends of a continuum (Fennema, 1984), the constructs are typically assessed separately.

The four categories of beliefs described here have often been included in research on women and mathematics achievement, course taking, and careers (Chipman, Brush, & Wilson, 1985). Chipman and Wilson (1985) report that confidence (and anxiety), perceived utility, and liking for or interest in mathematics are affective variables that have been shown to be related to these outcomes in mathematics. Although based on the research on women, sex is not a direct predictor of math-related outcomes in Eccles et al models (1985). Thus, there is reason to expect that these variables and relationships would be generally useful when trying to understand student learning in mathematics classrooms.

2. Motivations

Motivation is concerned with the causes of goal oriented activity (Dweck, 1986). Earlier constructs of intrinsic and extrinsic motivation have been extended with the model Dweck proposes. She uses the ideas of adaptive and maladaptive motivational patterns to link to behaviors of persistence and challenge seeking (adaptive patterns) and to behaviors of avoidance and low persistence in the face of difficulty (maladaptive patterns). These patterns affect cognitive performance (Diener and Dweck, 1978).

According to Dweck:

> Achievement motivation involves a particular class of goals--those involving competence--and these goals appear to fall into two classes: (a) learning goals, in which individuals seek to increase their competence, to understand or master something new, and (b) performance goals, in which individuals seek to gain favorable judgments of their competence or avoid negative judgments of their competence... (Dweck, 1986, 1040).

In general, learning goals are "intrinsic" to the individual and emphasize learning because it is personally challenging and personally valued. Performance goals are "extrinsically" based and emphasize learning motivated by influences outside the individual. In the latter case, motivation may be based on grades and teacher approval, for example. Dweck's analysis of motivation within achievement settings provides one scheme to use in defining constructs in motivation. Other researchers provide somewhat different views and categories (e.g., Chipman & Wilson, 1985; Corno & Rohrkemper, 1985; Covington, 1983; Deci & Ryan, 1985; Malone & Lepper, 1987; Nickerson, 1988; Paris, 1988; Ryan, Connell & Deci, 1985).

3. Attributions

Weiner's (1986) attribution theory of motivation and affect posits a three dimensional model of causality for success or failure: locus of control, stability, and controllability. Locus of control concerns whether an individual attributes success or failure to personal or environment causes. The stability dimension refers to whether the cause is seen as changeable or unchangeable. The third dimension, controllability, addresses whether or not the cause for success or failure is perceived to be within the individual's influence.

Paris discusses how Weiner's attribution theory links personal interpretations and affective consequences as they may impact on classroom interactions: "For example, when students attribute academic failure to their insufficient effort they may feel guilty....teachers who attribute failure to inability may feel pity and develop low expectations for students. Neither pity, anger, nor guilt are desirable emotions from teachers or students in the classroom" (1988, p.10; and see Graham & Weiner, 1987).

Although Weiner's (1986) theory classifies the perceived causes of achievement success or failure into eight categories, for its use within the classroom setting a selected number of categories may be more appropriate. We focused upon three of Weiner's classifications of causes for achievement:

1. internal , stable, uncontrollable (e.g. low ability);

2. internal, stable, controllable (e.g. never studies);

3. external, stable, uncontrollable (e.g. school has hard requirements).

These categories were selected because they are likely to be instructionally useful for teachers, and they address key achievement problems. The stability dimension was not included because the unstable extreme of this dimension is more apt to yield a situationally specific cause. Our objective was to assess the more generalized components of an individual's attribution of causality.

Another of Weiner's attribution classifications may be of interest to teachers, specifically the category formed by external, unstable, uncontrollable (e.g., bad luck). This fourth attribution category is defined here as unknown control. However, based upon Connell's work (1985), unknown control is examined in a somewhat broader context, addressing student confusion and inability to make sense out of causality within the cognitive domain. Following Connell, perceptions of control can be defined as children's understanding of the locus of the sufficient cause for success and failure outcomes. Unknown control is defined as a situation when a student has no perception of why an outcome occurs. Examples, provided by Connell (1985, p. 1022) include: "When I get a good grade in school I usually don't know why I did so well" and, "If I get a bad grade in school, I usually don't understand why I got it."

In summary, the four categories may be useful in understanding how students attribute their successes and failures in the classroom. Eccles (1983), among other researchers, has included attributions in models of academic choice and achievement. Attributions or cognitive beliefs about the reasons for one's future successes or failures constitute a current theory that may be useful to teachers in understanding variables that mediate differences in individual student performance (e.g., Covington, 1983).

Overall, we can summarize the answer to our first question, what do present psychological theories suggest as alternatives to the views of internalization and values of the 1964 taxonomy, in the following points:

1. The directed cognition and intentionality constructs imply a different view of the learner. The taxonomies appear to be based on a teaching-outcomes (objectives) framework. The alternative framework is cognitive/constructivist, with a focus on the learner's view of the teaching and learning processes.

2. The alternative constructs suggest a different role for the teacher/instructional activities. The taxonomies view the learner as reactive. The alternatives consider the learner as more self-directed, with the instructional activities and assessments designed to facilitate this development toward self-direction.

3. The mini- or domain-specific theories suggest an alternative to a taxonomy. The taxonomy used a single organizing principle, that of internalization. The alternatives and the domain specific research studies make it clear no specific ordering principle currently exists.

The second question we asked, what are the implications of these alternatives for educational measurement, can be briefly summarized here. Several of the implications are more fully illustrated below in the example of the Mathematics Assessment Project. There are several implications for assessment work in the directed cognition and intentionality areas:

1. There is a shift from using educational objectives as a starting point, as in the taxonomy (Krathwohl et al, 1964), to focus on the cognitive processes in the domain specific theories.

2. A facet approach to constructing assessment statements/items is needed, since there is no single construct or process that underlies the expanded domain of interest for assessment. The subject matter, construct and activity setting all require systematic representation in the assessment procedures.

3. The statistical analysis of assessments will change from a primary emphasis on total scale score analyses (e.g., item-total score analysis, factor analyses or other multivariate techniques with the only intent being to assign items to scales. Now analyses should focus on smaller units of items, looking at internal consistency among the items. The number of constructs of interest, activity settings, and, potentially, subject matter requires small sets of items per "cell" in a domain specification (Figure 1), much as the criterion referenced achievement measures focus on smaller units of items to provide instructionally relevant information.

4. With the shift from the emphasis on outcomes to mediating processes in the teaching-learning process, there is a need for teacher involvement in the development of assessment tools. Drawing directly on the psychological research base and translating to assessments requires the collaboration of the measurement-assessment developer and the teacher-assessment user (cf. Tittle, in press).

5. There is a shift from providing grades or other public evidence of assessment outcomes for students (total scale scores, normative comparisons) as implicitly supported in the affective taxonomy (see pp. 16-18), to the development of alternative forms for providing meaningful and useful results to teachers and learners. Two implications for practice result:

i. There is a need to accompany assessment materials with hypotheses to be tested and perhaps even instructional or intervention strategies for the classroom;

ii. There is a need to examine and justify levels of aggregation of results for individuals and classrooms. Since the assessment is focused on mediating influences or processes, not outcomes, the information is needed only by teachers and learners or others concerned directly with the instructional program.

These implications range over the full test development and reporting processes. The next section provides examples of the implementation of some of these implications.

IV. An educational measurement example: the Mathematics Assessment Project

The implications of this review of psychological theories and research have been explored in the Mathematics Assessment Project (MAP). The objective of this project is to develop an assessment tool based on research in directed cognition and intentionality for use in math classrooms in grades 7, 8, and 9. Following Guttman, we have used a facet approach to specifying the domain and in writing items.

In developing the assessment tool we considered the need for statements/items which addressed three facets:

1. the psychological constructs (reviewed above);

2. the content of the subject matter; and

3. the setting or context for the construct and content.

The first facet, the psychological constructs, is described above. The constructs included those emphasized in research in learning, including learning of mathematics: directed cognitions--meta-cognition and self-regulation; and intentionality--beliefs, motivations, and attributions.

With respect to the second facet, the content of the subject matter, we conducted exploratory studies to determine how specific the subject matter needed to be. The level of specificity of mathematics was varied across items in these exploratory studies. The wording of the math statements was varied from using the most general term (math), to a somewhat more specific term (word problems), to a more specific term (word problems with decimals), to the most specific, an actual example of a word problem (Brenda bought a bicycle for $89.00. Sales tax accounted to $7.12 Brenda paid with five twenty-dollar bills. How much change did she receive?). This approach allowed us to examine the differential response patterns for the various levels of specificity.

Not surprisingly, we found that the level of specificity of the statements affected how students responded to the statements. Examples are given in Appendix 2. As a result of these exploratory studies, it was decided to use the term, "math word problems," in effect controlling the subject matter facet. This is a more specific term than is typical of existing scales, which tend to use only the term "math." Also, use of the term, word problems, emphasizes an area of current concern in teaching mathematics. The exploratory studies indicated to us that any greater specificity would require items directly linked to students' curricular sequences, in this case mathematics topics in grades 7, 8, and 9.

With regard to the third facet, the setting or the context in which the construct is exhibited, we identified settings in which students would encounter math and the psychological constructs might be evidenced. The settings included: Homework, Seatwork, Group work, Direct Instruction (teacher), and Evaluative settings (grades, teacher made tests, standardized tests, and self evaluation). Since these are settings in mathematics classrooms around which teachers and students interact, they are settings likely to be meaningful to teachers. A major criterion used in establishing the feasibility of the project and selecting items for study was teacher judgment that items were useful for instructional planning.

In the MAP project we are thus concerned with validity of the assessment instrument in a particular manner: To what extent do teachers of mathematics rate the availability of student responses to the item as useful information for instructional planning (Tittle, in press)? With this aspect of validity of key importance, we considered the instructional settings for mathematics to be important. Studies of activities in math classrooms by several researchers (e.g., Stodolosky, 1988; Good, Grouws, & Ebmeier, 1983) reinforced our view that settings are an important facet. Research by Leinhardt and Putnam (1986) on student cognition during teacher lessons also provided support for the view that both self-regulation and intentionality might be different in this setting, as compared to the homework setting. Further, the trend to use group problem solving in schools, and even to some degree in mathematics classrooms, suggested that it was an important setting to teachers and students (e.g., Artz & Armour-Thomas, in preparation; Johnson, Johnson, Roy & Zidman, 1985).

Another aspect of settings came to the fore when we reviewed research on anxiety. There the research tended to examine anxiety in evaluative settings--test anxiety, or with respect to mathematics, broadly conceived. Again, there appeared to be merit to separating the various contexts and exploring the degree to which anxiety (and its counterpart, confidence) were situationally or context specific in the mathematics learning setting.

Figure 1 presents the domain specifications for the psychological constructs and settings. These facets and specifications can be compared with the categories of the affective taxonomy, Appendix 1. The type and greater number of constructs to be sampled, and the use of activity statements, has resulted in several practical implictions for the development of an assessment tool. Several of these implications were noted above. Key implications for measurement are the need for a facet approach in the item writing and the need to emphasize internal consistency analyses (e.g., Cronbach's alpha). The desire to represent constructs and activity settings in an assessment tool with a practical administration time of one class period led to a restriction on the number of items. For the beliefs, motivations and attributions, three statements were written per cell. Factor analysis across activities or across constructs were not useful, since there was too much heterogeneity built into the facet item statements. Thus, the most useful analysis was that of determining the internal consistency of the sets of three items, and whether adding units, across activity settings or across constructs, increased or decreased alpha coefficients.

Other major implications are the need to work collaboratively with teachers and the need to develop fairly extensive interpretations and uses of the assessment information. This will require adaptations from the research and intervention literatures, again focused specifically on mathematics settings. We anticipate making several forms of interpretive information available, and are in the process of developing such information in conjunction with mathematics teachers.

V. Summary

In the 1964 taxonomy the idea of a structure underlying the affective domain was used, the internalization principle. This had a simplifying effect, although the authors noted (p. 27) that they did not find any one psychological theory which could be used throughout the affective domain. After surveying the current research, we have argued to retain the psychological constructs that appear in active areas of research and embed them in subject matter and activity settings to link them to classroom instructional planning. We have also provided an example and some implications for educational measurement from this strategy. We know there will be change and alternative views in the future. Now we are curious about a third question, If we could talk to the measurment specialists of 2015 about their current assessments in the cognitive and affective domains, what would they say?

References

Figure 1
Appendix 1
Appendix 2

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Figure 1. Domain Specifications for the Mathematics Assessment Project
Two Facets: Psychological Construct and Setting

CONSTRUCT	SETTING: Seatwork	Homework	Direct Instruct.	Work in Group	classroom	Evaluation by/in: city-wide	teacher	self
Metacognitive	METACOGNITIVE ITEMS							
.before you begin, planning defining objectives, setting goals	NOT LINKED TO A SETTING - LINKED TO A SPECIFIC PROBLEM							
.as you work, monitoring progress, keeping track								
.after you work, evaluation, judging what was done								
.strategies employed								
Self-regulation								
.before you begin, planning, defining objectives, setting goals								
.as you work, monitoring progress, keeping track								
.after you work, evaluation, judging what done								
Affective Beliefs								
.utility, value of math								
.interests								
.expectancies of success/confidence								
.anxiety								
Motivation								
.internal learning goals								
.external performance goals								
Attributions								
.internal stable controllable								
.internal stable uncontrollable								
.external stable uncontrollable								
.unknown control								

Appendix 1.

Major Categories of the Taxonomies of Educational Objectives.

I: Cognitive Domain.

1.0 Knowledge.
2.0 Comprehension.
3.0 Application.
4.0 Analysis.
5.0 Synthesis.
6.0 Evaluation.

II: Affective Domain.

1.0 Receiving (attending).
2.0 Responding.
3.0 Valuing.
4.0 Organizing.
5.0 Characterization by a value or value complex.

Appendix 2

Two examples of the Effect of Level of Specificity of the Math Facet

Presented below are examples of statements with differing levels of content specificity which were randomly administered within eight classes to students at three junior high schools. The statements were presented on two forms which differed only in the wording of the most specific item. The most specific item on form 1 provided a verbal description of a word problem, while the most specific item on form 2 included an example of a word problem. Students indicated how true each statement was for them on a scale: very true, true, somewhat true, not very true and not at all true. The percentages represent the number of students responding "true" plus "very true" in example 1 and "very true' in example 2.

EXAMPLE 1:

General: I worry when I have to do math.

Specific: I worry when I have to do math word problems for homework.

Very Specific: (words) I worry when I have to do math word problems where I must multiply fractions for homework.

Very Specific: (example) I worry when I have to do math word problems like this for homework:

The traffic light changes every 20 seconds. How many times will it change in 1-1/2 hours?

Level of Specificity:	Form 1 (n=105)	Form 2 (n=104)
General:	31%	31%
Specific:	20%	17%
Very Specific: (word)	35%	-
Very Specific: (example)	-	40%

EXAMPLE 2:

General:	I know I can learn to do most math problems.
Specific:	I know I can learn to do most math homework problems which involve word problems.
Very Specific: (words)	I know I can learn to do most math homework problems which involve word problems with several addition steps.
Very Specific: (example)	I know I can learn to do most math homework problems like this: A softball team won 15 games, It lost 3 more than it won. How many games has the team played?

Level of Specificity:	Form 1 (n=105)	Form 2 (n=104)
General:	71%	74%
Specific:	53%	54%
Very Specific: (words)	47%	-
Very Specific: (example)	-	72%