Integrating the Revised Bloom's Taxonomy With Multiple Intelligences: A Planning Tool for Curriculum Differentiation

TONI NOBLE
National Australian Catholic University

Both the special education and gifted education literature call for a differentiated curriculum to cater for the wide range of student differences in any classroom. Gardner's theory of multiple intelligences was integrated with the revised Bloom's taxonomy to provide a planning tool for curriculum differentiation. Teachers' progress in using the tool to plan and implement units of work through learning centers was documented over 18 months in two small elementary schools. They reported greater confidence in their ability to broaden their curriculum and cater for different students' strengths across the multiple intelligences and intellectually challenge their students using first the original and then the revised taxonomy. The teachers saw their students as more successful learners as a result of this curriculum differentiation.

The complexity of today's social and educational contexts is reflected in the diverse student population in every classroom. The inclusive schooling movement has contributed to this diversity by advocating the inclusion of students with disabilities and learning difficulties in the regular classroom (Foreman, 2001; Stainback, & Stainback, 1996). The gifted education movement has long claimed that gifted children are unchallenged and are underachieving in the mixed ability classroom (Clark, 1997; Cohen, 1992; Tomlinson, 1999). Both movements call for a differentiated curriculum that acknowledges students' diverse strengths rather than their deficits and provides flexibility in terms of content, processes, and products to cater for students' individual learning needs. Yet research indicates that both beginning and experienced teachers are reluctant or unable to differentiate their curriculum to cater for the student diversity in their classrooms (Tomlinson et al., 1997).

Teachers College Record Volume 106, Number 1, January 2004, pp. 193–211

0161-4681

Multiple intelligences (MI) theory has become widely recognized as a useful framework for teachers making sense of their observations that different students have different strengths and learn in different ways. MI theory includes the traditional academic intelligences of linguistic and logical mathematical intelligences as well as spatial visual, musical, bodily kinesthetic, interpersonal, intrapersonal, and naturalist intelligences. Critical to MI theory is that each intelligence has a different developmental trajectory and different core processing operations (Gardner, 1999, 1993). This implies that students generally may engage higher order thinking and problem solving in an area of intellectual strength and only lower order thinking in an area of relative weakness. For example a student gifted in linguistic intelligence may produce a creative and original poem but may struggle with a task that demands high-level spatial ability.

The revised Bloom's taxonomy of educational objectives in the cognitive domain (RBT) provides a complexity hierarchy that orders cognitive processes from simple remembering to higher order critical and creative thinking. The revised levels from simple to complex thinking are Remember, Understand, Apply, Analyse, Evaluate, and Create (Anderson, 1999; Anderson & Krathwohl, 2001). One of the most innovative additions to the revision is the inclusion of metacognition as a component of a two-dimensional matrix across all levels of cognitive processes. The original taxonomy (later updated with the RBT) was chosen for integration with MI theory because most teachers at least have heard of it even if they do not actually use it. It also is easily understood, and the notion of a planning tool that incorporates activities that move from simple to complex thinking makes sense to teachers (Krathwohl, 1994).

The two typologies (MI and RBT) were integrated in a classification system that orders the MI on the horizontal dimension and the different levels of cognitive processes on the taxonomy on the vertical dimension (McGrath & Noble 1995a, 1995b, 1998; and updated by the researcher, Noble 2000, 2002). The MI/RBT matrix provides sentence stems to suggest learning activities and questions that range from simple to complex thinking in each of the MIs. In the matrix metacognition is seen as a component of intrapersonal intelligence and therefore does not require a third (and unworkable) dimension. In the study reported here teachers used the matrix to design learning outcomes and activities so that their students could demonstrate what they understood through different intellectual domains at the same or different levels of cognitive complexity. For example one Year 6 teacher used the planning tool to develop a science unit on natural disasters. One learning outcome required students to apply their understanding of the scientific processes in the formation and eruption of volcanoes (see Figure 1).

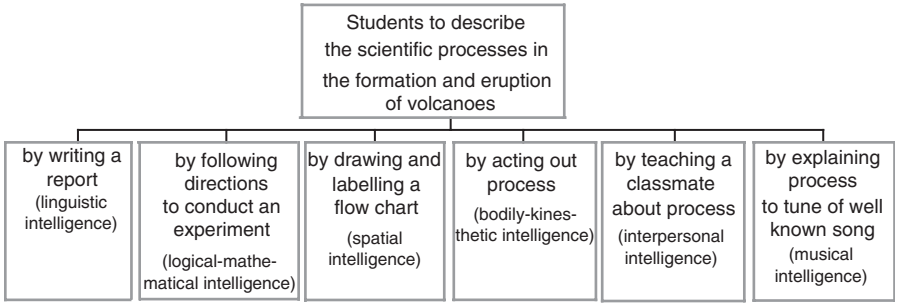

Figure 1. Demonstrating Understanding of Volcanoes Through Different MIs

In this example a similar level of cognitive complexity (the Apply level of the taxonomy) is employed for each task. As different students apply their knowledge of a volcanic eruption they engage different intellectual domains and devise different learning products. Therefore, the students are given multiple entry points to the same curriculum concept.

The matrix is designed to offer greater breadth and depth of learning activities than is usual in the traditional classroom that generally focuses on linguistic and logical mathematical intelligence and lower order thinking. For example, the matrix incorporates sentence stems for linguistic intelligence at the Remember level that prompt a student to tell the meaning of . . . or record facts about . . .; for spatial intelligence at the Apply level the students make a graph of . . ., draw a map of . . . ; and for intrapersonal (self) intelligence at the Evaluate level the student sets personal goals for . . . and judges their success in terms of specified criteria. The research project was designed as a formative evaluation of how the teachers in two elementary schools perceived the MI/RBT matrix facilitated their curriculum differentiation in different school subjects to cater for their different students' learning capabilities. The teachers used the matrix to plan diverse learning tasks for a curriculum unit of work. Each unit of work usually ran for one school term through learning centers and the students were given choice of tasks.

METHOD

All 16 teachers from kindergarten to Year 6 in two single stream elementary schools employed the MI/RBT matrix as a tool for planning curriculum units of work for learning centers over 18 months. The two schools were similar in population size and school system but very different in ethnic, cultural, and socioeconomic status. One school had 75% families with English as second language, 59% of parents in trade or unskilled professions,

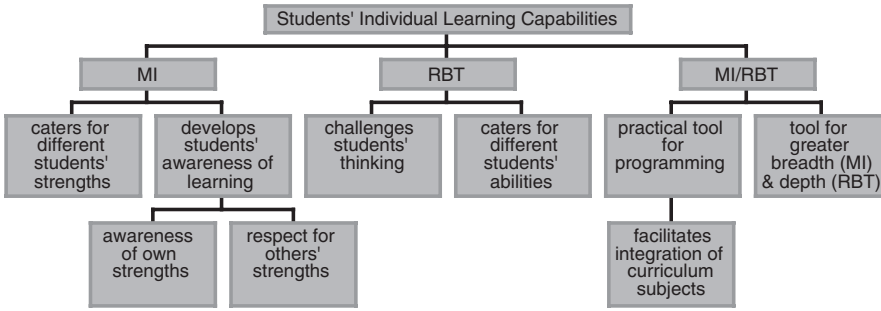

Figure 2. Teachers Making Meaning of the MI/RBT Model

and 39% of parents unemployed. The other school had 46% of families from ESL backgrounds, and parents were predominately employed in professional occupations. Both quantitative and qualitative methods were employed. Extensive triangulation of data was provided by an anonymous open ended teacher questionnaire completed by all teachers, whole staff focus group discussions conducted each school term, teaching team interviews where teachers were interviewed in pairs each school term, two open-ended principal questionnaires plus interviews, and the researcher's field diary. A small rural school also used the MI/RBT matrix for curriculum differentiation for learning centers and completed the same anonymous teacher questionnaire. The researcher had no direct contact with this school.

RESULTS

Data analysis revealed a recurring pattern or theme. The teachers reported consistently that the typologies of MI theory and RBT helped them in different ways to cater to the individual learning capabilities of the students in their classes and thereby facilitated student success. Combining the two typologies combined the benefits of both typologies and provided a practical tool for programming. The data analysis that follows is summarized in Figure 2.

MI THEORY

MI AS A TOOL TO CATER TO DIFFERENT STUDENTS' INTELLECTUAL STRENGTHS

The questionnaire findings show that 73% of the teachers perceived that MI theory provided them with a tool for catering for different students' intellectual strengths or ways of learning. Several of these teachers saw

particular benefits for children with academic weaknesses as illustrated by the following quotations:

> Children can flourish in new areas. The variety allows normally unacademic or quiet children the opportunity to display their talents. (ETQ7B)

One teacher wrote about a child who was a poor reader who lacked confidence in his academic ability: "He felt confident working on different tasks (based on MIs) as there was quite a number that he was able to tackle with confidence"(RTQ1).

Another teacher wrote about a student who "very rarely will answer a question or have a go. She demonstrates a real fear of failure." When given the opportunity to work in spatial intelligence activities this Year 5 student "who has an artistic gift . . . . completely came out of her shell. She interacted beautifully with other children and generally enjoyed herself" (RTQ3).

A model of intelligence that included nonacademic intelligences was also seen to be beneficial for students from non-English-speaking backgrounds who were not linguistically strong in English. One teacher, for example, reported the following about her less able students with non-English-speaking backgrounds:

> [They] have benefited in that they were able to achieve each week doing learning centres along with everyone else. They were able to write facts about Dinosaurs (linguistic intelligence), make models (bodily kinesthetic intelligence) and design puzzles (spatial intelligence) etc. They have become more confident in the classroom and I could say that this is partly due to learning centre work. (ETQ9B)

These examples illustrate that these teachers perceived that the MI framework was providing more options for children who were not academically or linguistically strong in English to demonstrate their knowledge and understanding in other ways.

STUDENTS' AWARENESS OF THEIR OWN STRENGTHS AND WEAKNESSES IN LEARNING

Fifty-five percent of the teachers on the questionnaire commented on how MI theory facilitated the students' awareness of how they learn best. For example:

> The LCs had a huge impact in developing the students' understanding of their strengths and weaknesses. The children liked to learn about how they learn. (ETQ6B)

> Students became more aware of their strengths and weaknesses. (ETQ8B and ETQ1A)

Teachers observed that the students' awareness of their strengths guided their choice of learning tasks during LC time. Kathleen explained:

> They are all picking tasks that they love doing and already are good at. It's only natural. I want them to become a bit more adventurous but it's a natural starting point to start with what you are confident in and then as you develop more confidence you'll have a go at taking more risks. (2nd TT Stage 2/3 19/8)

This teacher understood that early success is an important precursor for later risk-taking behavior. At the same time she knew that as the students gained confidence in the learning process, they needed to be more cognitively challenged. Another teacher also saw students gaining in confidence as they developed better understanding of how best they learn and experienced success in their areas of relative strengths. She perceived this increase in confidence generalizing to other subjects. She explained:

> I find what they've learned through LCs is being transferred across subject areas. They are really starting to look at their own learning. For example some Evaluate tasks in the different intelligences encouraged them to look at how they enjoyed the different tasks. They are able to say "well, I developed in this way." They are having more success in class because they have the opportunity to show other talents that they (and I) didn't know they had-and they show off a bit and that builds their confidence. (Jackie 3rdFGB 20/5)

Interestingly this teacher saw the use of the RBT's higher order Evaluate tasks in the different intellectual domains prompted students' reflection on their learning when engaging different intelligences. Another teacher also illustrated how students gained a deeper understanding and greater motivation for learning through their choice of different MI activities:

> The kids seemed to get more involved. They enjoyed the wider range of activities which helped them gain a better understanding of a novel. They could present what they knew either visually (spatial intelligence) or with some sort of rhyme (musical intelligence) and so on. (Sandra 2nd FG B 6/8)

STUDENTS' RESPECT FOR ONE ANOTHER'S LEARNING STRENGTHS

Allied to the students' awareness of their own strengths and weaknesses was their greater respect for their classmates' different learning strengths and a

greater willingness to work with others. Thirty-six percent of teachers referred to this outcome. Data from the focus group discussions with teachers also confirmed their observations that their students were valuing their classmates' strengths. Regina said, "They're starting to recognise that he's good at painting or this person is good at drama so I will work in that group" (2nd FG A 28/8).
Another teacher provided a more elaborated answer when she said the following:

> I find the children pick others who they would not normally work with. For example if a child wanted to do a Music task they went with someone who was musical that they would not normally have worked with in English. It was really interesting to see who chose who depending on what tasks they were doing. The kids were pretty smart at knowing each others' strengths. (2nd FG B 6/8/)

The same teacher also explained how sharing time was a forum for students to gain peer respect:

> They love doing the tasks and love having a sharing time at the end where they all get to show the others what they did and talk about it. They learned from each other and were often keen to create their own Grizzle or whatever after they had seen someone else's. I find this one of the most valuable times – even if the children didn't do all the tasks they saw the results of all the tasks. They really loved it. (Kathleen 2nd FG B 19/8/)

It also seemed to be a significant factor in challenging students to do complex tasks and complete good work. Peter explained, "Some of the kids didn't have a clue about how to do a rap or sound-off or some of the other difficult tasks. But once they saw how other kids went about it they became really keen to have a go themselves" (Peter 2nd TT yr.5/6 15/8).

MI AND STUDENT SUCCESS

Ninety-one percent of the teachers wrote comments on the questionnaire that indicated that they perceived that MI theory broadened their conceptualisation of how their students could be successful. The following are a few examples:

> The children all have the opportunity to shine. (ETQ2A)
>
> All students can be perceived as strong in one area. (ETQ11B)
>
> Children learn in a variety of ways not just one intelligence and MI is a great way to explore which ways each child learns best. (ETQ 4B)

In summary teacher feedback on the benefits of MI theory fell into three interrelated categories. The teachers perceived that, if they were catering for different intelligences or strengths and helping their students become more aware of how best they and their classmates learn, then they were providing more opportunities for their students to achieve and be successful.

THE REVISED BLOOM'S TAXONOMY

Just as MI theory served as a tool for the teachers to cater for their students' individual learning capabilities, so too did the RBT but in different ways.

THE TAXONOMY AS A TOOL TO CHALLENGE THE STUDENTS' THINKING

Sixty-four percent of the teachers on the questionnaire indicated that the taxonomy facilitated their programming to cognitively challenge their students. The taxonomy

> means children are challenged to think in new ways and to evaluate their own learning (ETQ4B)
>
> provides a challenge for everyone but particularly for able children (ETQ6B)
>
> allows children to be challenged/extended beyond the normal parameters (RTQ 1) and if children already have a clear understanding of a concept they don't have to start at the beginning but can be challenged at their own level (RTQ 3)

These teachers' comments indicate that Bloom's taxonomy created opportunities for them to cognitively challenge all their students, not only the children perceived as academically gifted. For example, two teachers independently referred to how nonacademic students composed a rap to communicate what they had learned. Composing a rap involved the student writing a musical score as well as incorporating curriculum content in the form of an original rhyme—a creative thinking task in the musical domain.

THE TAXONOMY AS A TOOL TO CATER TO DIFFERENT LEVELS OF STUDENT ABILITY

Forty-five percent of the teachers perceived that the inclusion of the taxonomy in the integrated MI/RBT model helped them to differentiate their curriculum to cater for the different levels of ability in their classrooms. The taxonomy

> allows you to cater for students with learning needs through to students who are gifted or talented (ETQ1A)
>
> ensures you are catering for a range of abilities in your class program from the basic to the more complex thinking skills (ETQ2A)
>
> enables teachers to design questions/tasks to suit the range of student abilities (ETQ11B)

As one teacher said, "Brighter children can be extended and less able children can spend more time on developing knowledge of the topic" (ETQ9B).

THE TAXONOMY AND STUDENT SUCCESS

Similar to MI theory, many teachers also saw the RBT facilitated student success. They saw the taxonomy helped them to program tasks at an appropriate level of thinking for different students. For example one teacher said, "Children can work on the same themes but at different (high or low) levels of thinking so everyone achieves and feels success" (ETQ10B); another said that Bloom's taxonomy "ensures all children can do some things and can be successful" (ETQ3A); a third teacher expressed this in a slightly different way in her comment "it reduces a sense of failure if children are working at an appropriate level" (ETQ6B); and a fourth teacher said, "All children are able to complete tasks on a given topic without the frustration of the task being too difficult or conversely being bored by the tasks that are too easy" (RTQ 2).

MI/RBT MODEL

MI/RBT AS A TOOL TO CREATE A BREADTH (OVER MULTIPLE INTELLIGENCES) AND DEPTH (DIFFERENT LEVELS OF THINKING)

Akin to the teachers' perceptions that either MI or RBT served as a tool to differentiate the curriculum in order to cater for individual learning capabilities, they perceived the integrated MI/RBT model combined the benefits of each individual model.

For example one teacher said:

> It helps me to know that I am catering to all the needs in my class because I have a huge range and looking at the activities suggested by the different intelligences (MI) and the levels suggested by Bloom helps me to feel confident that I am catering to those needs. (2nd TT yr.3/4 15/8/)

Another endorsed the benefits of combining MI with RBT. She said:

> Combining Bloom and MI makes it (matrix) a fantastic planning tool. It makes sure you get the breadth and the depth and you can control the way the children use it. If you know they have a weakness you can actually direct them to do the task. For example if they're poor in Word (linguistic intelligence) you can get them to continue to work on that and to try to develop their skills so I think it's great. (3rd FG B 20/5)

As illustrated by these two comments, all but one teacher indicated that their use of MI/RBT model enhanced their sense of professional competence in differentiating the curriculum to cater for student diversity. The one teacher who was the exception was a very traditional teacher who struggled with the whole concept of curriculum differentiation.

MI/RBT MATRIX AS A PRACTICAL TOOL FOR PROGRAMMING TO CATER TO INDIVIDUAL LEARNING CAPABILITIES

Teachers as practitioners are largely interested in how a theory works in practice. One way of evaluating this was to review their comments about how the MI/RBT model served as a practical tool for their programming. All but one of the teachers in the questionnaire expressed confidence in using the matrix for this purpose. For example:

> The problem is the initial fear and concern but once you have used the matrix once it becomes easy to do it again. (ETQ7B)

> I have used MI/Bloom in the following KLAs (key learning areas): English, Art and HSIE (Social Studies) and found it very successful. (ETQ6B)

> The grid is clear and easy to follow for programming. (ETQ6B)

The MI/RBT grid also was seen as a practical tool for programming to individualize learning for different students:

> The grid has helped me to define the tasks more clearly and to match a task to a child more easily. (ETQ10B)

> My programming has become more specific and related to the different developmental needs of the class. (ETQ9B)

For these teachers the integrated MI/RBT model appeared to combine the advantages of each individual typology in diversifying the curriculum to meet individual students' learning needs and the matrix provided the

structure to transfer the principles of differentiation into their practice. Georgina said the following:

> The most positive thing is that it (the matrix) gave me a different dimension to have a look at- a different way to develop a unit of work for HSIE (Social Studies). . . . It made me think of programming in a different light. Instead of giving them one or two experiences of learning something new, I gave them five within each contributing question. (3rd FGB 20/5)

Karen spoke about the practicality of the matrix and also implied that the greater choice of activities enhanced her students' learning:

> I find it really easy to program when you have one cohesive teaching unit using the grid and it's good for the kids because they can make connections amongst all the things they are learning on that common theme. (2nd TT A yr.2/3 15/8)

Another teacher spoke about his use of the grid in relation to a particular curriculum focus. He said, "I have used the grid to program on a Visual Arts theme. In the past I've ignored things but the grid lets me see what needs to be addressed and provides more of the big picture." When prompted to tell the researcher more about how the MI/RBT grid was working for him, he explained:

> The grid helps me to clarify the whole thing in my mind. Just by looking at the grid you can immediately see the different areas and the different levels and activities within each and how you are addressing the different intelligences and levels of thinking. It just makes it a clear picture to me; . . . If it's clear in my mind in the shape of a grid, then it's clear in my teaching. I'm sure I'll get to a stage where I am constantly using it and I am integrating KLAs (key learning areas) which I like to do. The grid is made to help you do that. (Sean 2nd TT A yr.5/6 15/8)

This teacher highlighted the important link between effective programming and effective teaching. His comments suggested that the MI/RBT grid was indeed a high level tool to facilitate not only effective programming but also to facilitate a change in the way he taught. He indicated that he is on a path of change and that he perceived that his use of the integrated MI/RBT model would become more and more spontaneous over time. He also suggested that the organization of the grid provides a useful visual graphic

organiser that helped him to visualize the breadth and depth of curriculum activities provided in his integrated curriculum program.

USING THE MI/RBT GRID TO FACILITATE STUDENT UNDERSTANDING OF HOW THEY LEARN

Four teachers used the matrix to explain the theoretical principles of the MI and RBT frameworks to their students. For example one teacher said:

> The children really got involved when I started to explain what Bloom and Gardner was—I showed them my grid and where I had placed different activities. They started discussing whether they would put it there and they were saying things like "no, that's easier" and then they would turn it around. The kids who really talked it through and developed a better understanding have given me really good work on different tasks. But the other kids who thought it was easy have given me complete rubbish or not what I want. So it's really helped some of the children to talk about what Understand is, what Analyse is, what Body activities and Self activities and so on are. (Antonella 2nd FG B 6/8)

In this example the teacher has shown that the MI/RBT model provided a tool for some of the children to develop a better understanding of the purpose/objectives of the learning activities. She saw their level of self-understanding and metacognitive thinking as directly related to their learning performance. The children who had a deeper understanding of the different intellectual domains and the levels of thinking engaged by different learning activities produced better learning.

MI/RBT AND STUDENT SUCCESS

Just as the teachers associated specific benefits of MI and RBT with student success, their comments also linked the integrated MI/RBT model to student success. Consider the following comment:

> All children have some intelligences that are more developed than others. Integrating MI and Bloom allows all children to be challenged in some areas of intelligence and be offered reinforcement in others. It helps children to recognise their gifts. (RTQP)

Teachers' observations of students' success in learning during MI/RBT LC time often generated surprise and delight. For example Sean spoke about one student appearing totally different when given the opportunity to work in the musical area. Similarly Antonella said the following:

> What I liked is the diversity of tasks. Some children are really extended and go off in directions that you would never even think of. I'm *amazed* by their creativity. (3rd FGB 20/5)

Kathleen also used the term *amazing* to express her greater insight into her students' learning capabilities:

> It's really *amazing* in that time when they present or share—you really learn a lot about the children. . . . You learn a lot in a very short space of time through what they produce and what they choose to do. (2nd FGB 6/8)

These teachers' positive affirmations of student learning outcomes also were linked to their perceptions of their students being more intellectually challenged at the highest level of Bloom. For example, Peter said, "I found the creative side coming out a whole lot more" (2nd FGA 28/8); Susan said, "[T]hey absolutely excel and show a lot of creativity and it's really important they can do that" (2nd FGA 28/8). Some of the teachers' new insights into students' individual learning capabilities was endorsed by one of the school principals who said, "I often heard teachers say 'I never thought X could do something like that'" (F. Diary p. 24 3/12) as an outcome of their work during MI/RBT learning center time.

DISCUSSION

The school reform literature calls for greater equity in schools with the imperative that they need to succeed for all students. One of the greatest challenges for teachers today is to provide a curriculum that effectively caters to their diverse student population. The one area that teachers in schools have most control over is how they teach the curriculum. The two typologies of MI theory and RBT offered different ways teachers could differentiate the curriculum to cater for this diversity. Seventy-three percent of the teachers perceived that MI theory helped them to diversify their teaching and learning strategies to cater for their students' different intellectual strengths. Several teachers perceived particular benefits for those students who had strengths in nonacademic intelligences, who were experiencing learning difficulties, or were students with English as a second language. These teacher observations provided some support that such curriculum differentiation could "open up options for individuals for whom the traditional educational program has failed" (Krechevsky & Gardner, 1990, p. 71). These findings were endorsed in team interviews and focus group discussions where different teachers explained how MI theory

provided multiple chances or ways for the students who were not academically strong to present what they knew in a way that was comfortable for them (Gardner, 1995; Krechevsky & Gardner, 1990). Their observations of these students had promoted greater insight and reflection about how these children learned best. Several of the teachers expressed amazement in the learning capabilities of some of their students when given the opportunity to do challenging higher order tasks in the intellectual domain that was comfortable to them. These examples of teachers' observations of their students' learning lend support to the following assertion by Gardner (1995):

> A pluralist approach opens up the possibility that students can display their new understandings—as well as their continuing difficulties—in ways that are comfortable for them and accessible to others . . . students secure a sense of what it is like to be an expert when they behold that a teacher can represent knowledge in a number of different ways. They discover that they themselves are also capable of more than a single representation of a specified content. (p. 208)

This study's findings provided some support for Guskey's (1986) findings that substantial change in teacher attitudes and beliefs is facilitated when teachers change their practices and begin to see the results of these changes in terms of their own students' learning outcomes. This chain of events is explained by the intense relationship that teachers have with their students and the connections the teachers make between what they believe and what they see working in their own classrooms (Guskey 1986). Not unexpectedly the research on teacher expectations has indicated that such a shift in teacher expectations could have a very positive effect on student learning and behavior, especially for low-expectation students (Good 1995; Good & Brophy, 1990).

Fifty-five percent of the teachers also saw that the MI framework helped their students to develop a better self-awareness of their own learning capabilities in different intellectual domains and 36% saw MI increased students' understanding of their classmates' different intellectual strengths and weaknesses. The conceptual link between students' understanding of how they learn best (metacognitive thinking as a component of intrapersonal intelligence) with other aspects of the students' self system was illustrated through various teachers' comments. These teachers' observations showed how they were linking students' increasing understanding of how they learned with their self-efficacy (students' judgments of their capabilities to accomplish different tasks), their sense of competence, and their motivation to learn. For example, a number of the teachers saw children who were low in academic self-confidence demonstrating more confidence

and competence when they were able to present what they had learned in their area of strength (usually in a nonacademic intellectual domain). These teachers' observations of students' high self-confidence in their area of strength and low self-confidence in an area of weakness accorded with Marsh and Craven's (1998, p. 191) belief that "self-concept cannot be adequately understood if its multidimensional, domain-specific nature is ignored."

Sharing time when students demonstrated their new learning was identified by several teachers as an important forum for facilitating not only student self-awareness of their learning capabilities but also their awareness of other classmates' learning capabilities. This conclusion accords with social comparison theory that implies the powerful influence of teacher and peer feedback and students' comparison of their performance with their peers on their self-concept (Marsh & Craven, 1998; McInerney & McInerney, 1998). This study's findings supported Chen's (1993) findings that students' opportunities to work in areas of strength in MI learning centers was the most significant factor associated with improvements in their self-esteem, classroom adjustment, and levels of engagement for students who were at risk of school failure.

Sharing time also facilitated students' understanding of how their classmates approached different or novel learning activities. For some children these observations of others' learning served as a catalyst to try something new and in the process be cognitively stretched. Sixty-four percent of the teachers on the questionnaire attributed particular benefits to using RBT to plan tasks that cognitively stretched or challenged all students' thinking, not just the academically able. These benefits were endorsed by repeated references to same outcome in focus group and team interviews. This lent some support that, when teachers assign higher order tasks, all students, not just the academically able, engage in higher order levels of thinking (Andre, 1979; Kreitzer & Madaus, 1994).

The teachers' cited comments about optimally challenging students' thinking also aligned with the substantial body of literature that shows important links with student motivation for learning (Pintrich, 2001). Csikszentmihalyi and Csikszentmihalyi (1988) demonstrated that students experience a state of flow when a task is cognitively challenging and matches their strengths. "Curiosity is enhanced when learners can work on personally relevant learning tasks of optimal difficulty and novelty as well as in interaction with others" (McInerney & McInerney, 1998, p. 172). Teachers' observations of students' preparedness to work at challenging learning activities in their areas of strength also aligned with Mayer's (2001) assertion that such use of the taxonomy can make learning more meaningful where the learner will demonstrate a willingness to invest time and effort in a task. These conclusions also support the constructivist approach to teaching and learning where learners learn best from

experiences in which they are passionately involved (Poplin & Stone, 1992).

However, the difficulties for some teachers of devising learning activities at optimal levels of difficulty were highlighted by one of the school principals. She believed that many activities were novel and fun but not intellectually rigorous. Her caution about fun activities at the expense of intellectual rigor was supported by McInerney and McInerney (1998, p. 175) who stated that "it is important that the use of highly motivating techniques should not be at the expense of the substance of learning." Her conclusion was that her staff was achieving a diversified program across the multiple intelligences but not always at higher order thinking levels of Bloom. Her observations lent some support to Anderson's (1994, p. 139) conclusion that use of the taxonomy for programming "takes far more time to use than teachers typically have at their disposal."

Nevertheless 64% of the teachers on the questionnaire (and endorsed by other data) reported that the inclusion of the taxonomy in the integrated MI/Bloom model helped them to provide appropriate curriculum challenges for the differing ability levels of students in their classrooms. By using the taxonomy they reported they were able to design activities that ranged from low level to higher order thinking skills. Appropriate or moderate learning challenges are seen as essential to providing the most effective learning context where students learn best (Csikszentmihalyi, Rathmunde, & Whalen 1993; Jensen 1998). In contrast in the one curriculum fits all approach where students with learning difficulties consistently fail, or alternatively gifted students succeed too easily, these special needs students lose their motivation to learn (Tomlinson 1999).

By combining both typologies in the integrated MI/Bloom model the teachers perceived the MI/Bloom matrix provided a practical structure or grid to facilitate their programming to cater for greater breadth (over the multiple intelligences) and greater depth (at different levels of thinking). A model that incorporates both multiple intelligences and different developmental levels of thinking has been seen as important in developing an inclusive classroom that caters for student diversity (Rief & Heimburge, 1996). Rief and Heimburge (1996) stated the following:

> Attention to multiple intelligences and developmental levels of students all need to be addressed and practiced if we are to reach and teach ALL of our students effectively. (p. 10, capitals in original)

For all but one of the teachers in this study the integrated MI/Bloom model appeared to combine the advantages of each individual typology in diversifying the curriculum to meet individual students' learning needs and the MI/Bloom matrix of sentence stems provided the structure to

transfer the principles of differentiation into their practice. The MI/Bloom matrix appeared to provide the visual graphic organizer that increased teacher confidence that they were effectively diversifying the curriculum.

Some teachers also used the matrix to facilitate their students' understanding of how they learn and thereby helped to shape their responsibility for their own learning. Those students who developed a deeper metacognitive understanding of the learning process not only took more responsibility for their learning but also produced better work. This focus on reflection on learning in relation to student's awareness of their intellectual strengths as well as on the complexity of the task was, according to Gardner (Noble & Grant, 1997), crucial to the development of intrapersonal intelligence. It was also a significant factor in leading to deep learning as defined by Biggs and Moore (1993). However the findings suggest that the teachers were at different stages in understanding how to use the MI/RBT model to improve their students' self-understanding of their learning capabilities.

In conclusion, by combining the typologies of MI and RBT the teachers gained an integrated model of the different ways that students learn in different intellectual domains and different thinking capabilities. Students' greater understanding of their own and others' learning and their motivation for learning during MI/RBT learning center time illustrated ways their learning can be made more meaningful. The wide application of the model for different year levels and different curriculum areas suggests the MI/RBT model is a practical tool that makes differentiating the curriculum easier for teachers. Although the two main schools represented significant differences in their social and economic context, both schools were small elementary schools that belonged to the same school system. Also the research analysis relied on the teachers' perceptions of how the MI/RBT LCs influenced student outcomes. The challenge ahead is for further research to be conducted in larger schools, with high school teachers and in different school systems and to directly measure student affective and learning outcomes. This challenge underpins current school reform initiatives—to assist teachers to develop an inclusive differentiated curriculum to meet the needs of all learners in our schools today.

References

Anderson, L., & Krathwohl, D. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Addison, Wesley Longman.

Anderson, L. W. (1994). Research on teaching and teacher education. In L. W. Anderson & L. A. Sosniak (Eds.), *Bloom's taxonomy. A forty-year retrospective* (pp. 126–145). Chicago: University of Chicago Press.

Anderson, L. W. (1999). *A revision of Bloom's taxonomy of educational objectives*. Unpublished manuscript.

Andre, T. (1979). Does answering higher level questions while reading facilitate productive learning? *Review of Educational Research*, *49*, 280–318.
Biggs, J. B., & Moore, P. J. (1993). *The process of learning*. Sydney: Prentice Hall.
Chen, J.-Q. (1993). *Building on children's strengths: Examination of a Project Spectrum intervention program for students at risk for school failure*. Cambridge, MA: Harvard Project Zero.
Clark, B. (1997). *Growing up gifted: Developing the potential of children at home and at school*. New York: Merrill.
Cohen, L. M. (1992). Differentiating the curriculum for gifted students. *Our Gifted Children*, *8*, 10–18.
Csikszentmihalyi, M., & Csikszentmihalyi, I. S. (1988). *Optimal experience: Psychological studies of flow in consciousness*. Cambridge, UK: Cambridge University Press.
Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. New York: Cambridge University Press.
Foreman, P. (2001). *Integration and inclusion action*. Sydney: Harcourt Brace.
Gardner, H. (1993). *Frames of mind*. New York: Basic Books.
Gardner, H. (1995). Multiple Intelligences. Myths and Realities. *Phi Delta Kappan*, *77*(3), 200–209.
Gardner, H. (1999). *Intelligence reframed. Multiple intelligences for the twenty-first century.* New York: Basic Books.
Good, T. L. (1995). Teacher expectations. In L. W. Anderson (Ed.), *International encyclopedia of teaching and teacher education* (pp. 29–35). New York: Pergamon.
Good, T. L., & Brophy, J. (1990). *Educational psychology. A realistic approach* (4th ed.). New York: Longman.
Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational Researcher*, *15*(5), 5–12.
Jensen, E. (1998). *Teaching with the brain in mind*. Alexandria, VA: ASCD.
Krechevsky, M., & Gardner, H. (1990). Multiple chances, multiple intelligences. In D. E. Inbar (Ed.), *Second chance in education. An interdisplinary and international perspective*. London: Falmer Press.
Kreitzer, A. E., & Madaus, G. F. (1994). Empirical investigations of the hierarchical structure of the taxonomy. In L. W. Anderson & L. A. Sosniak (Eds.), *Bloom's taxonomy. A forty-year retrospective* (pp. 64–81). Chicago: University of Chicago Press.
Marsh, H. W., & Craven, R. (1998). Academic self-concept: Beyond the dustbowl. In G. Phye (Ed.), *Handbook of classroom assessment: Learning, achievement and adjustment* (pp. 131–198). Orlando, FL: Academic Press.
Mayer, R. E. (2001). In L. W. Anderson & D. R. Krathwohl, (Eds.), *A taxonomy of teaching and learning: A revision of Bloom's taxonomy of educational objectives*. New York: Longman Publishers.
McGrath, H., & Noble, T. (1995a). *Seven ways at once: Classroom strategies for using multiple intelligences*. Melbourne: Longman.
McGrath, H., & Noble, T. (1995b). *Seven ways at once: Units of work for using multiple intelligences*. Melbourne: Longman.
McGrath, H., & Noble, T. (1998). *Seven ways at once: More classroom strategies and units of work for using multiple intelligences*. Melbourne: Longman.
McInerney, D. M., & McInerney, V. (1998). *Educational psychology. Constructing learning*. Sydney: Prentice Hall.
Noble, T. (2000). *Integrating Gardner's multiple intelligences theory with a revised Bloom's taxonomy: A new model for school reform*? Doctoral dissertation, University of Sydney.
Noble, T. (2002). Blooming with multiple intelligences. A planning tool for curriculum differentiation. *Learning Matters*, *8*(2), 8–12.
Noble, T., & Grant, M. (1997). An interview with Howard Gardner. *EQ Australia*, pp. 24–26.

Pintrich, P. R. (2001). In L. W. Anderson & D. R. Krathwohl (Eds.), *A taxonomy of teaching and learning: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Poplin, M. S., & Stone, S. (1992). Paradigm shifts in instructional strategies: From reductionism to holistic/constructivism. In W. Stainback & S. Stainback (Eds.), *Controversial issues confronting special education. Divergent perspectives* (pp. 153–180). Boston: Allyn & Bacon.

Rief, S. F., & Heimburge, J. A. (1996). *How to reach and teach all students in the inclusive classroom*. West Nyack, NY: Center for Applied Research in Education.

Stainback, S., & Stainback, W. (1996). *Inclusion. A guide for educators*. Baltimore: Brookes.

Tomlinson, C. A. (1999). *The differentiated classroom. Responding to the needs of all learners*. Alexandria, VA: ASCD.

Tomlinson, C. A., Callahan, C. M., Tomchin, E. M., Eiss, N., Imbeau, M., & Landrum, M. (1997). Becoming architects of communities of learning: Addressing academic diversity in contemporary classrooms. *Exceptional Children*, *63*(2), 269–283.

TONI NOBLE is a senior lecturer in the Faculty of Education, at the National Australian Catholic University. She recently coauthored and published a series titled *Bounce Back! A Classroom Resiliency Program* (2003) with Pearson Education that takes a curriculum-based approach to teaching positive psychology to elementary and middle school children. These teacher resource books incorporate her research interests in resilience, cooperative learning and multiple intelligences.