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## Teaching Academics to Students with Mental Retardation

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### Abstract

This paper investigates the notion of teaching academic skills to students with mental retardation (MR). The first part of the investigation looks at the historical forces that have driven the current need to teach academics to students with MR. The second part of the investigation is a critical review of the extant research, wherein individual studies are examined for sound educational strategies, and are also measured against the Council for Exceptional Children's published criteria for scientifically-based research. The final part of the investigation concludes that there are no moral, legal or educational reasons why students with MR should not be taught academic skills in line with their peers, although the research is somewhat limited.

## Chapter 1

### *Introduction of Topic*

The seed of the idea investigated herein was sown during the author's student teaching experience in a public high school in Virginia. This assignment was in a self-contained setting for students with moderate to severe mental retardation (MR), aged between 15 and 21. On three days of the week, the classroom was transformed into a 'potato bar', where the students prepared baked potatoes, drinks and other snacks for sale to the school faculty. This gave the students the chance to run a business, and to develop some of the social skills that would prove useful in later life, and while most of the cooking and the financial work was undertaken by the adults, the students clearly enjoy being involved in this 'real world' environment. However, as the days went by, the suspicion started to emerge that while these functional skills were being taught successfully, this was being done at the expense of some corresponding academic skills. It would be unfair to suggest that academics had been completely abandoned, as two days of the week were set aside to teach these, but the focus of the curriculum was definitely skewed towards functional skills and subsequent transition. Furthermore, as the author worked closely with individual students, there seemed to be a dearth of material specifically describing how to teach academics to students with MR. Most of the extant literature appeared to assume that the broader special education strategies, often seemingly developed for youngsters with learning disabilities (LD) and/or emotional disturbance (ED), would work just as well for students with MR. Finally the literature often

did not distinguish between strategies for students with mild disabilities and those with more severe manifestations.

At the highest level, therefore, a potential research question was starting to emerge – namely how should academics be taught to students with MR, and what balance should be struck between academic and functional content? This loose initial question thus provides the start point for this literature review.

### *Statement of Problem*

There is a growing need to teach academics effectively to students with mental retardation. This need stems primarily from the introduction of new legislation, such as the No Child Left Behind (NCLB) Act of 2001, which now demands a level of mastery of the general curriculum by all students (Browder & Spooner, 2006). However, the need is also supported by longer standing, but no less important, moral notions, such as that of holding all of our students to high expectations. Even as recently as the mid-1990s, teachers were being encouraged to focus on functional skills for many children with disabilities, as opposed to academics (Browder & Spooner, 2006), but this approach no longer appears to be acceptable.

### *Brief Review of Literature*

During the twentieth century, students with MR were largely moved out of institutions and segregated settings, and placed instead in the public schools (Trent, 1994). The forces that contributed to this move were driven by notions of morality (Trent, 1994), advocacy from powerful supporters such as President Kennedy (Heward, 2003), and advances in science (Dumas & Nilsen, 2003). These forces were underpinned in turn by more progressive supporting legislation (Turnbull, Turnbull, Shank & Smith, 2004). However, as these students moved in to the public school system, they tended to be taught a functional curriculum,

focused on life skills rather than academics, and in stark contrast to students without disabilities (Browder, Flowers, Ahlgrim-Dezell, Karvonen, Spooner & Algozzine, 2004). This situation changed with the passage of IDEA '97 and NCLB, in 1997 and 2001 respectively, with the result that students with MR must now not only be presented with the same general (i.e. academic) curriculum as their peers, but must also be seen to make progress through this curriculum (Turnbull, Turnbull, Shank & Smith, 2004). In addition, NCLB specifies the use of scientifically-based research and evidence-based practice in developing strategies for teaching this curriculum (US Department of Education, 2006).

It might be thought, therefore, that this comparatively recent legislation would have spawned a flurry of activity amongst educational researchers to investigate the relative efficacy of various interventions and accommodations in achieving these goals. Unfortunately this does not appear to have happened, and even as late as 2006, nearly a decade after the passage of IDEA '97, there is still insufficient research available to educators of students with MR (Browder & Spooner, 2006). This paucity of research is further undermined by a lack of clarity in the definition of scientifically-based research (Council for Exceptional Children, 2006). Despite this bleak situation, however, the few extant studies clearly show that students with MR can be taught academic skills (see, for example, Mastropieri, M. A., Scruggs, T. E., & Shiah, R, 1997; Mortweet, Utley, Walker, Dawson, Delquadri, Reddy, Greenwood, Hamilton & Ledford, 1999).

### *Procedure for Conducting Study*

This study fell naturally in to two parts. The first part investigated the history behind the move towards an academic curriculum for students with MR, and was conducted using a wide range of primary and secondary sources. This was achieved via a broad sweeping search

of book titles, research library databases and internet sources, for topics such as the history of MR in the United States, institutionalization, curriculum development for students with MR, the impact of educational legislation, and so forth.

The second part of the study featured a critical review of all of the extant primary sources that dealt with specific strategies for teaching academic skills to this population of youngsters. A search was undertaken for peer-reviewed journal articles that focused upon:

- School-age students with MR;
- Experimental studies that involved a defined classroom intervention;
- One or more of the four key academic skills (math, reading/literacy, science and social studies);
- Sources published since January 1, 1997;

In addition, the sources located via the above search were also tested to see whether or not they were likely to meet defined criteria for scientifically-based research.

#### *Contribution to Knowledge and Application of Study to Concepts/Practices in Education*

The ultimate aim of this project is to provide a critical analysis of the scientifically-based research that has been undertaken in the area of developing an academic curriculum for students with mental retardation. This will provide guidance for special educators in developing and adapting a curriculum for use within their own setting. In addition, this study should provide some criteria for special educators in accepting certain strategies as valid and research-based, and conversely highlight those areas that should be treated with caution.

#### *Definition of Terms*

- Academic Skills: Age-appropriate intellectual objectives, primarily defined by reference to the educational standards pertaining to the setting under consideration.

Thus, for example, academic skills in a fourth grade math class in Virginia would be those skills defined by the corresponding fourth grade math Standards of Learning (see VDoE, 2006, for more information). For the purposes of this discussion, these skills encompass math, reading and literacy, science and social science.

- **Curriculum:** The sum total of all skills taught, and experiences presented to, students in an educational setting. This definition is intended to include the transfer of knowledge to the student that is the prime tenet of education.
- **Functional Skills:** Those skills that are needed to perform frequently demanded tasks in everyday life (Browder & Spooner, 2006), such as personal hygiene skills, shopping skills, broader social skills, etc.
- **General Curriculum:** The sum total of the core academic skills (see above) taught to the students within an educational setting. For the purposes of this discussion, the general curriculum is often referred to by authors as the skills taught to students without disabilities, and is contrasted with an alternative (often functional) curriculum for students with disabilities.
- **Generalization:** The ability to perform a learned skill in a new setting, or with new people or materials (Browder, 2001).
- **Mental Retardation:** A disability characterized by significant limitations both in intellectual functioning and in adaptive behavior, as expressed in conceptual, social, and practical adaptive skills. The disability originates before age 18 (AAMR, 2006).

It should be noted that several of these definitions (e.g. functional skills) are potentially unstable, and this level of volatility will be discussed during the main body of this text where appropriate.

### *Limitations of the Study*

The study suffers from a number of limitations, foremost of which is the paucity of available research. Initially it was thought that the search date criterion might have been too restrictive, but when this was removed and an open-ended trawl conducted, few additional sources that also met the other search criteria were located.

Secondly many initially promising sources had to be rejected as they did not clearly refer to students with MR. Some papers simply do not define the nature of the disability that is under consideration, and refer instead to students with ‘learning problems’ (Steele, 2004) or ‘special needs’ (White, 2004). Some sources deal specifically with students with multiple disabilities (e.g. Hedeon & Ayres, 2002), or attempt to focus on mental retardation, but are unable, for whatever reason, to use students that exhibit mental retardation without concomitant disabilities (e.g. Faykus & McCurdy, 1998). Some sources use only adult subjects (e.g. Zhang, Cote, Chen & Liu, 2004) and were rejected as potentially misleading, as they cut across current developmental cognitive theories (Eggen & Kauchek, 2004).

Finally, while the following topics have a potential bearing upon teaching academics to students with MR, they were deliberately excluded from the scope of this project for reasons of clarity, except where discussion thereof provides relevant input:

- Placement
- Assessment



## Chapter 2

### *Overview*

In order to answer satisfactorily the questions that surround the issue of academics for students with MR, the following structure was adopted. Firstly, the historical forces that have coalesced to move youngsters with MR out of segregated settings and in to the public schools were investigated. Secondly, consideration was given to the ways in which schools then changed to accommodate these students, and the evolution of a separate and discrete functional curriculum. Thirdly, an investigation was undertaken of the subsequent legislation, that decreed the focus should be on academics for students with MR. Fourthly, a review of the literature covering the teaching of academics to students with MR was conducted and reviewed, based upon the criteria used to define scientifically-based research and evidence-based practice. Finally the paper will conclude in Chapter 3 with a number of conclusions and recommendations for the special educator.

### *Historical Background*

The notion of educating students with MR in public schools in the United States is a relatively recent phenomenon. Despite the fact that the earliest examples of special education classrooms in public schools occurred in Providence, RI in 1896, and focused wholly upon MR, (Heward, 2003), such an enlightened approach was rare indeed. During the latter half of the nineteenth century and the first half of the twentieth, many people with MR were incarcerated in institutions, where conditions were more akin to prisons than to schools or hospitals (Dumas & Nilsen, 2003), and where the inhabitants were referred to as ‘inmates’ (Trent, 1994). In 1930, more than 68,000 people with MR were incarcerated in the United States (Dumas & Nilsen, 2003), placed there either at the request of their relatives, or at the

behest of the courts. The prevailing notion amongst the scientific community at this time was that people with MR were uneducable exemplars of moral failure – “criminals who have committed no crime... [and] a most dangerous element in the community.” (Fernald, quoted in Trent, 1994, p.161) – who should be locked away for the safety of all. Worse still was the contemporary idea that mental retardation was a hereditary trait, as espoused by eugenicists such as Henry H. Goddard. Goddard not only provided ‘evidence’ for this view via his flawed study of the Kallikaks, but also single-handedly developed the concept of ‘the moron’ (Trent, 1994). As a result of such tainted science, more than thirty thousand people with MR were subject to involuntary sterilization in the United States during the first half of the twentieth century (Dumas & Nilsen, 2003), and more than half of the states had enacted marriage-restriction laws in order to eliminate “the menace of the feeble-minded” (Trent, 1994, p.131).

Early efforts to educate people with MR within the institutions were limited. Basic “habit training” (Trent, 1994, p.108) focused on teaching the students how to negotiate the routines used within the institutions themselves, and involved skills such as obedience and punctuality. Any attempt to teach a broader academic or functional curriculum tended either to face active opposition from the educators themselves, or was used merely as a salve to placate the more insistent parents. Ironically, the more progressive establishments might teach some level of functional curriculum, such as basic money recognition, but these skills would then never be used, as most students would spend their entire lives institutionalized (Trent, 1994).

The twentieth century saw a number of initiatives, some active and some fortuitous, that combined to improve the prospects of people with MR. Firstly the Great Depression forced many states into near bankruptcy, and with restricted funds, the institutions could no

longer support a growing population of patients. Superintendents were thus forced to develop procedures to enable the release of some inmates, in order to free up space for others, and these procedures often focused on the promotion (i.e. teaching) of good behavior and some life skills (Trent, 1994). It is interesting to note that this system of release appears not have been driven by any philanthropic moral imperative, but merely by an on-going and widespread shortage of money. It is also no coincidence that this release process was referred to as “parole” (Trent, 1994, p. 225).

Secondly, during World War II, more than 2,000 generally well-educated conscientious objectors found themselves working inside the institutions, and many were appalled at what they saw (Trent, 1994). This led to a growing trend after the war for public exposés of conditions inside America’s public facilities, a trend that was wholeheartedly supported by the professional media. Occasionally these reports showed exemplary conditions and progressive methods; more often, however, they showed filth, squalor and institutionalized violence. This drive to reveal to the American public what was being done to some of their fellow citizens reached its zenith in 1972 with Geraldo Rivera’s shocking television documentaries on conditions inside the Willowbrook State School on Long Island, and New York’s Letchworth Village, which attracted the largest ever TV audience for a local news item (Trent, 1994).

Thirdly, scientific developments during the first half of the twentieth century saw a move towards viewing mental retardation as a psychological condition rather than as a moral aberration. For example, Binet and Simon’s IQ test, although initially purloined by Goddard and his cronies, at least allowed a scientific diagnosis of the condition, and provided some a level of granularity in categorizing the severity of MR (Heward, 2003). Such scientific

evidence led, in 1959, to the American Association on Mental Retardation (AAMR) publishing its first formal definition of mental retardation, that revealed that many people previously labeled as merely ‘feeble minded’ were, in fact, functioning in the borderline category, with an IQ only marginally below average, and certainly not justifying lifelong institutionalization (Heward, 2003). At around the same time, President John F. Kennedy also provided powerful advocacy for those with mental retardation, as his own sister, Rosemary, was diagnosed with the condition and subsequently given a disastrous lobotomy. In 1961, Kennedy established the first President’s Panel on Mental Retardation, which significantly guided subsequent national policy, and introduced the emphasis on education and citizenship that continues to this day (Heward, 2003).

The key change during the twentieth century, however, was the creation of a body of legislation, fuelled by the progressive changes in perspective described above, which had a powerful impact upon the lives of those with MR. Although the 1954 decision in *Brown v. Board of Education of Topeka* was not specifically aimed at those with MR, the ruling did specify education for all children on equal terms, and forced the issue of all educational segregation in to the spotlight (Heward, 2003). A more significant case for advocates of those with MR came in 1972, with *Pennsylvania Association for Retarded Children (PARC) v. Commonwealth of Pennsylvania*. Here the state argued that there was little point in admitting children with MR in to the public schools as they were uneducable, but as this argument was not supported by a shred of evidence, the court ruled in favor of PARC (Heward, 2003). A key component of this case was the emphasis placed in the ruling upon a free and appropriate public education (FAPE) for children with MR, in as close a placement to the general education classroom as is possible for the individual student (Trent, 1994). This growing

momentum away from the notions of segregation and institutionalization ultimately led to the passing of the Education for All Handicapped Children Act (Public Law 94-142) in 1975, which ensures that all children with disabilities receive an appropriate public education, and which lives on today in the various Individuals with Disabilities Education Acts (IDEA) (Trent, 1994).

Despite these changes for the better, however, life for youngsters with mental retardation is still fraught, as much thinking among the broader population seems to be informed primarily by ignorance, misconceptions and prejudice. Comments such as ‘Why would you want to teach children who cannot learn?’ (Heward, 2003, p.199) and the slang use of the term ‘retarded’ (Heward, 2003, p.199) highlight this atavistic perspective, as does the 2003 Gallup Poll that revealed that only 34% of Americans support having children with mental retardation in the same schools as other students (Crabtree, 2003), let alone in the same classroom.

### *The Functional Curriculum*

The historical changes described above did not occur in a smooth and homogenous manner. Some school districts in the United States had educated children with MR in public schools for many years, and by 1974, the year before the passage of the Education for All Handicapped Children Act, 1.3 million children with disabilities were receiving a public education, albeit often in special classrooms or settings (Heward, 2003). Conversely, other school districts seemingly took a long time to adapt to the new terrain, and continued to exclude these children until well in to the 1970s (Trent, 1994). However, having finally got youngsters with MR in to the public schools, educators were now faced with the decision of

what exactly should be taught, and how this should best be achieved for a population of students about which very little was known.

The extant model of the day had been developed by schools during the 1950s, and used IQ scores to promote a three-tier system of classification whereby children with MR were either educable, trainable or uneducable. Those students lucky enough to be receiving an education, and who were deemed educable, would be taught academics up to fourth grade level, whereas those who were merely trainable would be taught only to attend to their daily needs. The ‘uneducable’ were simply left to rot in the institutions (Biasini, Grupe, Huffman & Bray, 1998). While we may view such a system as offensive and anachronistic, with its echoes of the earlier labels of ‘moron’, ‘imbecile’ and ‘idiot’ (Trent, 1994), it is sad to note that the trainable and educable labels are still in use today (e.g. Newport News Public Schools, 2006).

The first attempt to replace this tripartite system adopted a developmental model, whereby the ‘mental age’ or grade equivalent of the student would be derived using proprietary psycho-educational assessment tools. Thus whatever curriculum was taught in general education to students of that age or grade would then be presented to the student with MR, regardless of how appropriate this might be (Browder et al., 2004). If the age or grade equivalent decreed it, academic material developed for infants was therefore often used to teach older children with MR (Browder & Spooner, 2006). Such an approach not only resulted in inappropriate materials being used, but was also underpinned by age and grade equivalent scores, both of which are notoriously misleading (Salvia & Ysseldyke, 2004).

The developmental model, in turn, was soon challenged by the work of Lou Brown from the University of Wisconsin-Madison. In a key paper from 1976, Brown and his

colleagues forcefully attacked the notion of segregation (or, as he called it, homogeneity) in any guise for people with disabilities (Brown, Nietupski & Hamre-Nietupski, 1976). Brown and his colleagues recognized that with the broader move away from segregation and institutionalization, any differences between people with disabilities and their peers would engender fear and rejection. However, by teaching the skills required to perform independently in the community, such differences would be minimized. Thus students with mental retardation should be taught functional skills, although it is important to note that at no point did the authors advocate teaching functional skills instead of academics. Brown and his colleagues also attacked any form of segregation within education, rejecting separate classrooms for students with disabilities as absurd (Brown, Nietupski & Hamre-Nietupski, 1976). It is also worth noting here that while Brown and his colleagues provide a powerful and coherent argument, and strongly advocate on behalf of children with disabilities, this argument is purely philosophical in nature, and is not underpinned by any scientific research. In thirteen pages of text, there is only one citation which refers in turn to a non-scientific paper.

Despite this apparent lack of contemporaneous empirical evidence, Brown's argument that "the criterion of ultimate functioning" (Browder & Spooner, 2006, p.6) should be used to drive curriculum development received widespread acceptance, and by the late 1980s and early 1990s, this view was firmly ensconced in the public school system (Browder et al, 2004). Many textbooks from the time, and the majority of intervention studies (Browder et al, 2004), reflect this paradigm shift towards a functional curriculum, which continues to be the default approach to this day (Wehmeyer & Agran, 2005).

It is important to note, however, that the definition of a functional skill is not agreed upon. Browder and Spooner (2006) define functional skills as “those skills that are needed to perform frequently demanded tasks in everyday life” (p.201). Brown, McLean, Hamre-Nietupski, Pumpian, Certo and Gruenwald (1996) define a functional skill as “an action that will be performed by someone else if a person with disabilities does not perform it” (p.83). Thus an action such as feeding the dog is functional, as someone else must perform it if the person with a disability does not (Brown et al., 1996). Other authors refer to ‘life skills’ as apparently synonymous with functional skills (Council for Exceptional Children (CEC), 2000); still others talk about “functional knowledge” (Heward, 2003, p.218). Even the normally reliable Browder and Spooner (2006) confuse the matter further by also referring to “functional academics” (p.201). What is apparent from the literature is that all learned skills are treated as existing upon a continuum. Thus at one end of the scale we have purely academic skills – the pedagogical equivalent of *ars gratia artis* – such as the ability to solve a quadratic equation. At the other end of the scale reside the purely functional skills, such as the ability to tie one’s own shoelaces. In between we have skills that require a combination of functional and academic skills – Browder’s functional academics – such as the ability to calculate the correct change from a monetary purchase, which requires simple subtraction. While this distinction between functional skills and academic skills will serve for the purposes of the current discussion, it should be noted that it ignores any meta-cognitive component of functional skills that may also be useful for academics, such as meta-attention (i.e. the ability to evaluate one’s own level of attention) (Eggen & Kauchak, 2004).

In summary, therefore, we can be confident in stating that for the last twenty years, the teaching of a functional curriculum to students with MR was the preferred approach for the



majority of public schools, despite the fact that this was initially driven by a moral argument rather than by proven academic results. However, there appears to be no consensus about what specific functional skills should be taught, or whether these should supplement or replace academic skills. Also a key point to note is that the majority of students with MR have traditionally been taught a different curriculum from their non-disabled peers and, as we shall see, this is no longer acceptable.

### *The Move toward an Academic Curriculum*

As we have seen, the historical impetus has been for students with disabilities to move out of a segregated setting and in to the public schools. This has been driven by legislation, advocacy and a growing moral awareness that this is the right thing to do (Heward, 2003; Brown, Nietupski & Hamre-Nietupski, 1976). Under the auspices of the 1975 IDEA Act, all children have the right to a free and appropriate public education. However the term ‘appropriate’ is vague, and does not specify curriculum content. Thus if a purely functional curriculum for a child with MR was deemed to be appropriate, as decided by the Individualized Education Program (IEP) team, then this is what was taught.

Two powerful pieces of more recent legislation have had a dramatic impact upon notions of curriculum for students with MR. Firstly, the growing trend towards more accountability in education was enacted in law via the 1997 amendments to the Individuals with Disabilities Act (IDEA '97, Public Law 105-17), which now specified that students with disabilities must be included within state and district assessments, albeit with accommodations or an alternate assessment if necessary, and that these students would also have access to the general curriculum (Heward, 2003). The legislation gave a target date of July 2000 for all states to implement these changes, but only Kentucky had a workable system

that pre-dated IDEA '97 (Browder et al., 2003). In the remaining forty-nine states, confusion reigned. Many states that had implemented a functional curriculum simply developed alternate assessments that were based upon these functional skills, and continued to ignore academics altogether (Browder & Spooner, 2006). Some alternate assessments were so poorly conceived that they merely relabeled functional skills as academics. Thus in one state (tactfully unnamed), the ability to sit upright in a wheelchair was assessed as an academic math skill (Browder et al., 2004).

Although some educators had started to realize that this might not be the intended interpretation of IDEA '97, they barely had time to draw breath before the issue was brought to a head by the passage of the No Child Left Behind Act (NCLB, Public Law 107-110) in 2001, with its clearly stated expectation that *all* students will make quantifiable *academic* progress (Turnbull, Turnbull, Shank & Smith, 2004). Even the one percent of students who qualified under NCLB for inclusion in the embryonic alternate assessment program still had to show progress against standards that were aligned to the academic curriculum of their peers. No longer would special educators be able to rely on a functional curriculum.

However, here we come across an apparent gap in the seemingly smooth flow towards treating students with MR as we would any other child. As we have seen, the impetus to teach students with MR functional skills started in the mid seventies, and was initially driven from a purely moral perspective, albeit sound and commendable. There was subsequent research done to prove the effectiveness of a functional curriculum (e.g. Brown et al., 1979), and this not only improved the efficacy of functional teaching, but also served to confirm to educators that students with MR can learn functional skills. However, in 1997 IDEA '97 suddenly appears to decree a switch away from functional skills in favor of a move to academics, but it

is difficult to see whether the passage of this law was driven by advocacy or scientific research, or a combination of the two.

If the IDEA '97 legislation itself is examined, the text makes numerous references to the future use of research in developing sound practices for teaching children with disabilities (e.g. Amendments to IDEA, 1997, Section 672). It also makes some vague references to past research, as in “over 20 years of research has demonstrated that the education of children with disabilities can be made more effective” (Amendments to IDEA, 1997, Section 631, Para. 5), and uses this claim to promote high expectations and access to the general curriculum (Section 614, Para. (b)2). However, at no point are the specific research documents upon which these claims are based cited within the legislation. It is therefore impossible to find within the law itself a logical argument that links any prior scientific research to the switch from a functional curriculum to an academic equivalent.

Because of the apparent lack of research, therefore, it would seem that the move to teach an academic curriculum to students with MR espoused by IDEA '97 was simply bundled up within broader notions of normalization, full access and desegregation. This in no way undermines the moral correctness of such a move, but it does throw the issue of an academic curriculum in to a slightly different light, for while teaching academics to students with MR seems morally, and now legally, the right thing to do, it might prove difficult to achieve without a sound body of pre-existing and scientifically-proven strategies.

Another potential area of difficulty surrounds the definition of an academic curriculum, for if students with disabilities are now to be assessed on their progress through this apparently extant academic pathway, then it is reasonable to assume that their teachers should at least have had some notion of what this entails. Alas, this proves not to be the case.

As Browder and Spooner (2006) ruefully note, “it is important to be knowledgeable about the general curriculum [but] this is not an easy task” (p.1). Fortunately this potential area of confusion can be dismissed comparatively easily, as most educators and researchers now define the general (i.e. academic) curriculum in terms of standards (e.g. Wehmeyer & Agran, 2005; Stein, 2004). As Browder and Spooner (2006) write, “standards are general statements of what each student should know or be able to do when they complete each grade level...”(p.2). By defining a discrete set of standards that covers all academic areas, each state effectively defines its own academic curriculum. For example, the educational standards currently in use in Virginia define, for each grade, what the students are expected to know. By extrapolation, we can deduce that the general curriculum in math, say, is simply the content that must be taught to all students in order to be able to demonstrate competency in each of the grade-appropriate standards (Virginia Department of Education, 2006). By considering standards, as opposed to the more abstract concept of a curriculum *per se*, the problem of working with an agreed definition is neatly side-stepped. It does not matter what is taught, or how, provided that each of the students completes the course with the requisite knowledge and skills to be able to demonstrate competency in the appropriate state. This has important implications for students with disabilities, as it allows the widespread use of differentiation during teaching, provided that these are effective in achieving the ultimate end goal of competence.

### *Academics for Students with MR*

Having recognized the necessity for an academic curriculum for students with MR, an exercise was conducted to investigate whether there is a body of research that provides

educators with the requisite battery of effective and evidence-based strategies for use with this population of students.

To this end, a search was undertaken using the College of William and Mary SWEM library facilities. The following three databases were interrogated:

- InfoTrac OneFile provided by Thomson Gale;
- PsycINFO provided by EBSCOHost;
- ERIC provided by EBSCOHost.

The search criteria were carefully considered. For example, as much of the impetus for teaching academics to students with MR comes from IDEA'97 and NCLB, it was decided only to locate sources published since 1997. Similarly, only primary sources were considered. The search criteria used were therefore as follows:

- Peer-reviewed journal entries;
- Experimental studies that involved one or more specific interventions;
- Related to academic skills (reading, literacy, math, science, social science);
- Publication dates between January 1, 1997 and June 30, 2006;
- Specific to school-age students with mental retardation;
- Primary sources only;

Although the hit rate initially looked promising, the results ultimately proved dismal. For example, a search on PsycINFO for papers relating to reading strategies for students with MR initially returned 127 hits. However, further research found that only four sources met the above criteria. Subsequent searches on InfoTrac and ERIC both returned fewer initial hits, many of which were duplicates, and that ultimately located no additional sources.

The mechanical search process, while focusing upon math, say, or reading, was not sophisticated enough to be able to filter out sources that referred to functional academics, and this gave the author the opportunity to perform this filtering manually instead. Two additional papers fell in to this category and both were ultimately rejected. Firstly the paper by Schloss, Kobza and Alper (1997), which initially looked promising as it investigated the effects of using peer tutoring when teaching functional math skills, was rejected as the sampled population contained students with concomitant disabilities, such as Down's Syndrome, and the results do not differentiate between those students with MR and those with other disabilities. Secondly the paper by Stromer, Mackay, McVay and Fowler (1998) was also rejected, as it focused on an intervention for stimulating mediating behaviors – a psychological technique that “has relevance for teaching instruction-following skills” (p.1). Thus while this was a potentially relevant paper, the intervention was neither educational nor focused upon an academic subject area.

Likewise the database search also failed to differentiate between experimental and qualitative studies, and again the author was provided with the opportunity to review the latter. Two qualitative studies were found. The first, by Wehmeyer, Lattin, Lapp-Rincker and Agran (2003) was purely observational, and while it measured access to the general curriculum for students with MR, and provides interesting background reading, it did not provide any specific intervention aimed at increasing this access. The second, by Hedeon and Ayres (2003) was not only purely observational, but involved a single student with concomitant disabilities. Thus both of these papers were again also rejected.

A total of six studies were found that specifically addressed academic instruction for children with MR (see Table 1). No relevant sources relating to science or social science were located. Despite this paucity of research, however, a number of themes still emerge.

### *Intervention Effects*

Firstly, and most importantly, all six studies showed improved academic results for the students with MR as a result of the respective intervention. The three studies relating specifically to sight word instruction involve a total of thirteen students, aged from 7 to 15, and all clearly show that children with MR can learn sight words, although the three interventions each used a different approach. Didden, Prinsen and Sigafoos (2000) tested a system of pictorial prompts, but found that while all six students learned the sight words used in the intervention, for some the accompanying pictures appeared to ‘block’ recognition of the word itself. Indeed two of the six students showed the most impressive results when presented with the words in isolation. Sterling, Robinson and Skinner (1997), by contrast, used cassette tapes, so that the three students could hear the words as they read them, from either a ‘fast’ tape or a ‘slow’ tape. Again all of the students learned the relevant sight words, but individuals responded to the fast and slow tape differently. Thus two students learned the words more quickly from the fast tape, whereas the third responded better to the slow tape. Rohena, Jitendra and Browder (2002) used a time delay method with four Puerto Rican middle school students with MR, where the students were asked to look at each sight word, and then given a four second period in which to reply with the correctly read response. Although the sight words used were all English, the intervention was tested in both English and Spanish, the students’ primary language. Three of the four students learned all of the sight words used, and the fourth learned many of the words, and also showed a distinct

improvement over the pre-intervention results. Surprisingly, the language of instruction did not appear to have a significant difference, and the researchers speculate that this is because the English instructions matched the students' current level of proficiency in this language.

The study relating to phonological reading skills, by Conners, Rosenquist, Sligh, Atwell and Kiser (2003), showed some interesting results. The study included forty students, aged 7 to 12 with MR, half of whom were given a ten-week phonological reading skills program. The remainder operated as a control group. Firstly, there was a significant improvement in sounding out skills, and non-word and sight word reading. Children with MR can therefore “acquire one of the most important reading skills, and one that past research has told us is *particularly* difficult for children with MR.” (Conners et al., p.13). Secondly, the end results were apparently unrelated to IQ score. This finding is made all the more powerful by the relatively large number of students involved in the sample. Finally, the researchers acknowledge that the instruction, though effective, was intensive and resource-hungry, and involved one-on-one teaching, of which “...most children will not have the benefit.” (Conners et al., p.15).

Mortweet, Utley, Walker, Dawson, Delquadri, Reddy, Greenwood, Hamilton and Ledford (1999) used four students, aged 8 to 10, to investigate the effectiveness of classwide peer tutoring (CWPT) when teaching spelling skills in the general education classroom. CWPT involves pairing students who alternate the roles of tutor and tutee as requested by the teacher. The students with MR were deliberately paired with respective students who did not have a disability, but both were given an opportunity to undertake both roles. After several weeks of instruction involving CWPT sessions, and accompanied by weekly spelling tests,



three of the four students with MR had increased their grades from Ds and Fs to As and Bs. The fourth student was frequently absent and missed much of the instruction.

The final study unearthed by the search process looks at using computer assisted instruction (CAI) to teach students with MR mathematical problem solving skills. Mastropieri, Scruggs and Shiah (1997) selected 4 students, aged 8 to 11, and trained them to use a CAI program, developed by the researchers, that introduced via an animated tutorial a seven step approach to solving an addition or subtraction word problem (e.g. “If Caren had 8 crayons and she lost 5 of them, how many crayons were left?” (Mastropieri, Scruggs & Shiah, 1997, p.5)). Students were allowed to work at their own pace, albeit with teacher assistance, and after little more than a week of instruction all four students were showing improved results when compared with the pre-test condition, although the researchers, in an otherwise thorough description, fail to inform the reader how many questions were presented on the post-test. Thus when we are told that Student A got zero questions correct on the pre-test, and fourteen questions correct a week later, the result is encouraging but, unfortunately, relatively meaningless. The students were also interviewed to discover whether they enjoyed using the computer with its animated tutorial, and whether this had helped them figure out math problems. All responded in the affirmative, and three of the four said that they would like to use computers for more school work. (Mastropieri, Scruggs & Shiah, 1997, p.9).

Table 1

*Experimental Studies for Teaching Academics to Students with MR*

Author & Date	Subject	Participants & Setting	Design	Description	Intervention	Findings
Conners, Rosenquist, Sligh, Atwell & Kiser, 2003.	Reading (phonological skills)	40 children, aged 7-12, all with MR label.	Pre-test/post-test control group design.	Students matched in pairs on several criteria. One of each pair placed in intervention group; other placed in control group (random selection).	Three instructional units: blending; letter-sound association; sounding out. 22 20-minute lessons in total.	Intervention group showed: Significant improvement in sounding out; Significant improvement in nonword & sight

Author & Date	Subject	Participants & Setting	Design	Description	Intervention	Findings
				Pre-assessment, intervention, post-assessment.		word reading; No improvement in predicting sounding out;
Didden, Prinsen & Sigafoos, 2000.	Reading (sight words)	6 children, aged 7-9, all with moderate MR label.	Single subject alternating treatments design.	Investigating whether pictures 'block' the learning of corresponding sight words in students with MR. Baseline, then iterative instruction and assessment.	4 of 20 sight words presented at random, with or without corresponding pictures, across 20 sessions.	All students learned all 20 sight words. Other results inconclusive, although an implication that pictures may actually impede learning rate.
Mortweet, Utley, Walker, Dawson, Delquadri, Reddy, Greenwood, Hamilton & Ledford, 1999.	Reading (spelling)	2 classrooms, each with 25 children without disabilities, plus 2 children with mild MR. The 4 children with MR were aged 8-10.	Withdrawal treatment design.	Used classwide peer tutoring (CWPT). Students with MR chosen and placed with peers without disability. Pre-assessment results taken from students' prior spelling results. Also measured academic engagement.	Intervention group used CWPT for weekly tutoring and testing. Paired students shared role of tutor and tutee.	CWPT was effective for all students with MR. 3 of the 4 moved grades from D-F up to A-B. 4 <sup>th</sup> student moved from Fs to Ds, but was frequently absent. Academic engagement time also increased during CWPT sessions.
Rohena, Jitendra & Browder, 2002.	Reading (sight words)	4 children, aged 12-15, all with moderate MR label, all of Puerto Rican ancestry.	Parallel treatments design.	Is constant time delay method effective in teaching English sight words, and if so is it better in English (2 <sup>nd</sup> language) or Spanish (1 <sup>st</sup> language)? Baseline, then iterative instruction and assessment.	English sight words presented daily with time delay in Spanish, time delay in English and no time delay. Subsequent generalization was also measured.	Constant time delay proved effective in getting all students to learn all sight words, although some students required more instruction than others. However, language of instruction seemed not to be a factor in teaching English sight words. Subsequent generalization at 90-100% for 3 of the 4 students.
Sterling, Robinson & Skinner, 1997.	Reading (sight words)	3 children, aged 10-12, all with MR label.	Single subject multiple baseline design.	Investigating whether listening to tape recorded words helps students learn sight words. Baseline, then iterative instruction and assessment.	Students were presented with list of sight words and simultaneously played the list of words on a tape recorder (read either quickly or slowly). Assessed after every period of instruction.	2 students learned all sight words. Third student had more profound disability, and learned majority of words. Speed of taped words did not make any significant difference. No investigation of generalizability.
Mastropieri, Scruggs & Shiah, 1997.	Math (problem solving)	4 children, aged 8-11, all with mild MR label.	Single subject AB design.	Pre-assessment, intervention, post-assessment.	Computer-assisted instruction (CAI)	All students showed significant

Author & Date	Subject	Participants & Setting	Design	Description	Intervention	Findings
					used to introduce a 7-step approach to problem solving.	improvement in problem solving. No significant improvement in generalizing from computer to paper and pencil. Students enjoyed using the computer.

### *Generalization*

Two of the six studies located also refer specifically to generalization – a notoriously tricky skill for students with MR to develop (Drew & Hardman, 2004). However these two studies appear to show conflicting results. Thus Rohena, Jitendra and Browder (2002) taught sight words that related to grocery shopping, such as ‘butter’ and ‘the Deli’ (p. 6). Pre-testing, instruction and post-intervention assessment, using the constant time delay method, were undertaken in both the classroom and in two grocery stores. The intervention was effective, as all four participants learned successfully to generalize from the classroom environment to the grocery store, but once again there were individual differences, in that some students appeared to respond better to instruction in Spanish, whereas others preferred English. However the key point is that generalization here was successful.

In their math study, Mastropieri, Scruggs and Shiah (1997) did not specifically teach any generalization skills, but hoped that their successful computer based instruction would also result in improved results when applied to a paper and pencil test. Thus once computer instruction and assessment was complete, the students were asked to respond to a similar set of math word problems using paper and pencil. Disappointingly, only one student could recall all of the seven steps of the procedure without prompting, and therefore it was only this student who showed success in generalizing from the computer to paper and pencil. The other

three participants could remember the majority of steps, and while they showed improved results using paper and pencil when compared with their respective pre-test scores, this improvement was not seen by the researchers as significant (Mastropieri, Scruggs & Shiah, 1997, p.6).

At a higher level, none of the six studies located in total featured any attempt to measure subsequent maintenance of the skills developed by the participants during the respective interventions. There were no reported follow-up activities, regardless of design. The two studies that attempted to measure generalization of these skills did this as part of the immediate post-intervention assessment, rather than after an elapsed period.

*Is the research scientifically-based?*

Having identified that there is no substantial body of research that encompasses academics for students with MR, are educators justified in claiming that the few research studies that do exist constitute evidence-based practice as promulgated by NCLB (US Department of Education, 2006)? The process of deciding exactly what constitutes scientifically-based evidence in the field of education is confused, to say the least. Partly this is symptomatic of the fact that educational research is not underpinned by the laws of science, as is ‘pure’ scientific research, such as in chemistry or physics. Indeed educational research has been described as ‘the hardest science of all’ (Berliner, 2002). Partly, however, the problem lies in the fact that there are numerous organizations investigating the various issues, all of which seem prepared to weigh in with opinions at every opportunity. For example, there is currently no agreement about what research designs constitute sound practice in education. The field of special education, with its broad range of disabilities and placement options, is even more complex still, but here the Council for Exceptional Children (CEC) at least

provides some guidance. In 2003, the CEC's Division for Research defined four types of research study that are acceptable, namely experimental group, correlational, single subject, and qualitative (Odom et al., 2005). It is therefore against these criteria that we will examine our paltry selection of located sources.

The 2003 study by Conners, Rosenquist, Sligh, Atwell and Kiser (2003) uses a pre-test post-test control group methodology, with the students with MR randomly assigned to one or other of the groups. In addition the researchers managed to devise an approach that encompassed 40 students with MR – an unusually large number for special education research. This is therefore a reasonably strong design that would easily seem to meet the CEC experimental group criterion (Odom, Brantlinger, Gersten, Horner, Thompson & Harris, 2004).

The 1999 study by Mortweet, Utley, Walker, Dawson, Delquadri, Reddy, Greenwood, Hamilton and Ledford (1999) adopts a similar design, but the researchers were unable to employ any form of random assignment. Their system of classwide peer tutoring involved strategic pairing of students, and the four students with MR who were included in the study therefore had to be carefully matched with their peers, rather than randomly assigned. Although this study would therefore have to be described as quasi-experimental (Fraenkel & Wallen, 2006, p.277), it still falls within the CEC criterion of an experimental group design (Gersten, Fuchs, Compton, Coyne, Greenwood & Innocenti, 2006).

The remaining four studies have few participants and no control group, and use a single-subject design. This design is commonly used in special education research, especially with low-incidence disabilities (Odom, Brantlinger, Gersten, Horner, Thompson & Harris, 2005). During nearly three decades of research covering educational best practice for students

with moderate to severe disabilities, single-subject designs constituted more than two thirds of the total (Browder & Spooner, 2006). A single-subject design is an experimental approach that investigates changes within individuals as a result of applying the experiment (Curry School of Education, 2005). Thus each subject also acts as a control (Horner, Carr, Halle, McGee, Odom and Wolery, 2005). For example, a study that contrasted the results of an intervention on a student with MR with those on a student with LD would not constitute a single-subject design, whereas a study that contrasted the 'before' and 'after' results on the student with MR would be a single-subject design, as it measures change within the subject. Paradoxically, however, single-subject designs can involve more than one subject, provided that each subject in the study is measured for this 'before' and 'after' effect. Indeed, this is the source of strength for many single subject designs, as an experiment that has been repeated successfully with several individuals obviously has greater validity than an experiment applied to only one person. The question that arises, however, is how many 'single subjects' need to be included before an intervention can be said to be scientifically proven? One source says that the intervention must be repeated successfully at least 30 times (Browder & Spooner, 2006); another says five iterations are sufficient, provided that the total number of students used is at least twenty (Horner, Carr, Halle, McGee, Odom & Wolery, 2005). The CEC follows this second approach but further specifies that studies must have been completed by at least three sets of researchers in three different geographical locations (Odom, Brantlinger, Gersten, Horner, Thompson & Harris, 2004).

Didden, Prinsen and Sigafoos (2000) use a single subject alternating treatments design with their six participants, where an initial single baseline is followed by one of five treatments. Each of these involved sight words only, or a combination of sight words and

pictures, and each treatment session was accompanied by an assessment to measure effectiveness. The entire experiment was completed with a final post-test. Unfortunately the researchers do not specify the order in which each of the interventions was presented, merely saying instead that the approach was identical to a previous study from 1990 (Didden, Prinsen and Sigafoos, 2000, p.18). The reader must therefore undertake additional reading in order to fathom the design, but then it is discovered that the 1990 study used four experimental conditions (Singh & Solman, 1990), whereas Didden, Prinsen and Sigafoos use five. Thus it is difficult for the reader to discern the order in which the treatments were presented, and whether or not this might have influenced the results.

Sterling, Robinson and Skinner (1997) use a single subject, multiple-baseline and alternating treatments design, whereby each of the three students was baselined twice, using two sets of sight words, and then given one of two interventions (sight word list plus fast or slow taped words) followed by an assessment. This process was repeated until each student's scores had achieved criterion-level, or until they had reached a plateau where clearly no further progress was being made. It appears that one intervention was followed immediately by the other, but the authors are somewhat vague in describing this.

Rohena, Jitendra and Browder (2002) use a single subject parallel treatments design with their four participants. This, they claim, "uses random assignment" (p.7), but it is unclear how this was achieved, as the authors specifically state that "the order in which the participants were introduced to the intervention was predetermined" (p.7). Both interventions (Spanish and English constant time delay instruction) plus a no-treatment condition were presented daily, with at least two hours between each. Each session ended with an assessment

to measure results. Once again, the process was repeated until each student's scores had achieved criterion-level, or until they had reached a plateau where progress was stalled.

These three single subject designs therefore also appear to meet the criteria laid down by the CEC for acceptable research studies, although the reader needs to bear in mind each of these study's respective vagaries and omissions. Furthermore, the fact that each of these studies involves more than one participant can be used to argue for a level of replication. Although none of the studies satisfies the numerical replication criteria laid down by either Browder and Spooner (2006), Horner and colleagues (2005), or CEC (Odom et al., 2004), they could each validly be used as a starting point in this replication process.

Unfortunately Mastropieri, Scruggs and Shiah (1997) do not specify the design that they use, although from their description of the experiment, it appears that they use a single-subject A-B approach, with a pre-test followed by intervention and subsequent post-test. However, with this sort of design, “the baseline is extremely important” and “one should collect a minimum of three data points before implementing the intervention” (Fraenkel & Wallen, 2006, p.308). Mastropieri, Scruggs and Shiah only appear to apply their pre-test once, and this does not therefore meet the criteria laid down by the CEC for acceptable design, as it does not use “a baseline phase [that] provides repeated measurement of a dependent variable” (Odom, Brantlinger, Gersten, Horner, Thompson & Harris, 2004, Table 3).

One final issue is worth considering here also. As we have seen, the criteria for deciding whether a single study constitutes sound science are confused, with various bodies weighing in with differing opinions. Similar confusion exists at the meta-analytic level. There is no single over-arching body in the US that reviews all of the published research to decide whether a specific practice has been tested sufficiently for it to be hailed as a fully-fledged



evidence-based practice. Instead special educators must once again and rely on the CEC. However, it is telling that here even the CEC itself is concerned, as demonstrated by the recent newsletter that highlights the discrepancy between the legislative demands for evidence-based practices, and the dearth of research. (CEC, 2006).

## Chapter 3

### *Findings, Conclusions and Recommendations*

Looking first at the historical overview, we can clearly see a movement away from segregation and in to the public schools for students with MR. Thus during the first half of the twentieth century, institutionalization tended to be the norm, with a limited education that often comprised little more than training in basic life skills. By the 1990s, however, the default position was that all students with disabilities must be educated in the general classroom, unless it could be justified that this was not in the best interests of the individual

The curriculum presented to these students during this period also underwent a number of discrete changes. During the 1950s, the tripartite ‘educable, trainable and uneducable’ system tended to be the norm. This patronizing system, that conveniently managed to overlook the ‘uneducable’, was replaced in many schools during the 1970s by the developmental model, which was frankly not much better. This model used the notorious measure of ‘mental age’ as a criterion for curriculum selection, resulting in high school students having to wade through books intended for much younger readers. Advocates such as Lou Brown challenged this approach by presenting the ‘top-down’ functional curriculum, which concentrated on minimizing differences between students with MR, and their peers without disabilities, by teaching the life skills that, if not mastered, would label them as ‘other’. It is important to note that during this period there was never a movement to remove academic skills from the curriculum altogether, and indeed if functional and academic skills could be taught in parallel, then this was ideal. However, the key findings here are that functional skills tended to take priority, and all of the curricular approaches adopted up to this point resulted in students with MR being taught different skills in school than their peers.

The functional curriculum was deeply engrained within the public school system when the status quo was abruptly shaken up by IDEA '97, with its imperative that all students should have access to the same general (i.e. academic) curriculum. This was followed soon after by NCLB, which stated that schools systems would also be held directly accountable if students failed to show progress through this academic curriculum.

The second main thread of this investigation therefore looked at the research available to educators now charged with the task of ensuring satisfactory progress through an academic curriculum for students with MR, and here the findings are limited. A search for specific academic interventions from 1997 onwards found only six papers in total. The flurry of activity among researchers that it might be thought that IDEA '97 would generate appears not to have occurred. However, the most important finding of this investigation is that all six of these studies clearly demonstrate that students with MR can successfully learn academic skills, albeit with the caveat that one of the six features a weak design.

Students with MR were thus taught sight word reading (Didden et al., 2000; Rohena et al., 2002; Sterling et al., 1997), phonics (Conners et al., 2003), spelling (Mortweet et al., 1999) and math problem solving skills (Mastropieri et al., 1997). The area of generalization, however, showed mixed results. Thus the Rohena study (2002) demonstrated that with additional instruction, newly acquired academic skills could also be generalized beyond the classroom setting. Conversely the Mastropieri study (1997) indicated that improved results using a computer were not well generalized to paper and pencil, although unlike Rohena, Jitendra and Browder (2002), this skill was not specifically taught, but was simply assessed at the end of the experiment, apparently in a move driven more by hope than science.

At a meta level, it was also found that five of the six studies met CEC criteria for acceptable experimental designs. However, it should be noted that three of these were single subject designs, the results of which ideally need to be reinforced in the future via further replication, as specified by the CEC (Odom et al., 2004).

One of the six studies indicated that youngsters with a more profound disability might require more instruction, but the results were still promising (Sterling et al., 1997). Similarly another study highlighted different learning rates among students with MR (Rohena et al., 2002). This is not surprising, and is in line with what happens in any classroom, where each student has an individual learning style and a propensity to grasp some concepts more effectively than others. If a student with MR therefore takes longer to learn an academic skills than his or her peers, or needs an additional intervention, then so be it. This is certainly not justification for presenting a different curriculum altogether. Indeed, Connors, Rosenquist, Sligh, Atkins and Kiser (2003) present a powerful argument in favor of teaching academics to students with MR, when they report that the improved post-assessment scores across twenty students were seemingly unrelated to IQ score. This effectively undermines the anachronistic view that students with more profound MR are somehow only ‘trainable’, whereas those with a milder manifestation of the disability are ‘educable’.

For the prospective special educator, looking for a battery of strategies to teach academics to students with MR, the situation is not as bleak as the lack of research might at first suggest. Although only six studies were found, five of these met three key criteria. Firstly they all showed improved academic results for students with MR; secondly they all appeared to meet CEC-approved notions of scientifically-based research; and finally they each used a different intervention. Thus straight away the special educator is presented with five proven

interventions that may be used as appropriate, plus a sixth that may be effective, but that, if used, should be approached with more caution.

In addition, many of the studies use interventions that are not necessarily specific to the academic subject being taught, but that could potentially be applied across the board, or in combination. Thus, for example, the Mortweet study (1999) evidenced the efficacy of classwide peer tutoring for teaching spelling to four students with MR, and although not specifically demonstrated by the study itself, it is conceivable that classwide peer tutoring might also be effective in teaching sight words, say, or multiplication tables. This argument is furthered by Browder and Spooner (2006), who note that peer tutoring is also effective when teaching reading fluency skills to children with significant cognitive disabilities (Browder & Spooner, 2006). Likewise, Rohena and colleagues (2002) demonstrated similar efficacy when using a constant time delay procedure to teach sight words, but it does not require a great leap of the imagination to suggest that this technique might prove equally sound in teaching spelling, or (again) multiplication tables.

However, the greatest area for deriving this potential synergy must surely lie in computer-assisted instruction. Matropieri and colleagues (1997), despite their weak design, developed a computer program specifically for teaching math problem solving, and other sources report that similarly impressive results have been shown for students with MR in teaching reading and writing skills (e.g. Wehmeyer & Agran, 2005). As Matropieri, Scruggs and Shiah note, "...the potential of computers for students with mental retardation has yet to be realized" (p.9). Furthermore, computer-assisted instruction not only seems promising as an effective instructional strategy, but may also help with a secondary, but no less important, issue. As noted earlier, Connors and colleagues (2003) expressed concern that their

intervention, though effective, was resource hungry and required significant additional input from the teacher. However, computers may help to bridge this potential gap between the teaching resource required and that which is available (Mastropieri et al., 1997). In their experiment, students were allowed to work on the computer at their own pace, but “...when teachers are unavailable, CAI tutorial programs may be beneficial supplements to instructional programs...” (Mastropieri et al., 1997, p.9). Thus it is all the more frustrating that the Mastropieri study does not appear to meet CEC acceptability criteria, as this is an area that would definitely benefit from additional research.

Another area that would benefit from further study is that of investigating whether the combination of one successful strategy with another might ‘compound up’ the overall educational effectiveness. Single strategies, including constant time delay (Rohena et al., 2002), and classwide peer tutoring (Mortweet et al., 1999) produced academic gains. However, it is not difficult to introduce constant time delay in to a classwide peer tutoring situation. Whether or not this combined strategy would prove more effective, or whether there might be some spurious ‘blocking’ effect caused by superimposing one efficacious strategy on to another, is unknown, as no research appears yet to have been undertaken that tests whether a combination of interventions provides an even more powerful effect than a single strategy applied in isolation, but it is a fascinating area to ponder.

A question that may occur at this point is whether, in view of the lack of research, we are justified in locating strategies that have been proven for children with other developmental disabilities, such as LD or autism, and extrapolating these to accommodate children with MR, especially if the sample chosen for research included some students with MR (e.g. McDonnell, Thorson, McQuivey & Kiefer-O’Donnell, 1997). This might ultimately prove to

be necessary, but it is a dangerous approach, as research has revealed that students with MR display specific characteristics. For example, in one older study, the learning styles of children with MR are contrasted specifically with those of students who have LD. Both sets of students were asked to solve a number of math problems that required the use of four discrete mathematical skills (listening vocabulary, problem solving, basic concepts and fractions) (Parmar, Cawley & Miller, 1994). Significant differences were found between students with LD and those with MR in all four skill areas, with listening vocabulary posing the greatest challenge for students with MR. The study goes on to conclude that “students with MR may not benefit from the same instructional practices and curriculum organization as students with LD” (Parmar, Cawley & Miller, 1994, p.7). Thus any attempt to extrapolate the results of a study on youngsters with LD, say, to a population of students with MR may indeed prove effective, but equally might not. However, it would appear that under no circumstances can such extrapolation be currently justified as an acceptable evidence-based practice.

A final area that requires consideration is whether teaching an academic curriculum to students with MR might somehow compromise the teaching of functional skills. For example, there is questionable utility in teaching a student with MR how to solve a quadratic equation at the expense of teaching him or her how to tie their shoelaces. Ideally we would teach both as required, but school time and resources are limited. Predictably, there is very little research specific to this question. Browder and Cooper (2006) tackle the question head on, and rightly state that teachers should not consider academic skills and functional skills as an either/or proposition, but that the two can be combined. Thus, for example, the academic math skills of addition and subtraction can be taught by using money, and by teaching the student how to make purchases and calculate correct change. However, this only takes the student so far, as it

is difficult to see how a more erudite academic skill, such as solving a quadratic equation, could be taught using this combined approach. However, this concern might not even be valid, for looking at the educational career of the vast majority of students without disabilities, there do not appear to be many who are successful academically but who are unable to tie their shoelaces (present fashion trends notwithstanding). Indeed, for this particular example, we might simply try slip-on or Velcro shoes and forget shoelaces altogether, thereby allowing more time for, say, reading instruction. The point is that there may be plenty of time for effective and creative teachers to teach both academic and functional skills, either separately or in combination, to students with MR, as they seem to do perfectly well for youngsters without disabilities. In the absence of any research that deals with this topic directly, we must conclude that there should be no conflict between academic and functional skills in the development of a curriculum for a student with MR. This conclusion, though speculative, should be our default option, as it not only holds teachers and students alike to high expectations, but also undermines any argument that may come from educators who do not support academics for students with MR.

The message to take away from this paper, therefore, is that there are no moral, legal or evidentiary reasons why we should not be teaching academic skills to students with MR. In the moral sphere, we should, at the highest level, be treating all of our youngsters alike, and presenting the same curricular and educational opportunities to everyone. The legal underpinning is provided primarily by IDEA '97 and NCLB, and is accompanied by research, which although limited, is full of boundless possibilities, and offers a tantalizing glimpse of what might be achievable. Thus we can reasonably conclude that youngsters with MR could, should and must learn far more in the way of academics than traditionally has been presented



to them. However, the special educator must also remember that all students, both with and without disabilities, are distinct individuals, each with a unique set of learning characteristics. One child may respond well to a specific intervention, whereas the next may flounder. At no point must any teacher ever give up on any student. Teaching academics to students with MR is, as we have seen, a relatively recent phenomenon, and can sometimes seem frustrating, but at no point should we ever forget that these youngsters are all unique and wonderful individuals.

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