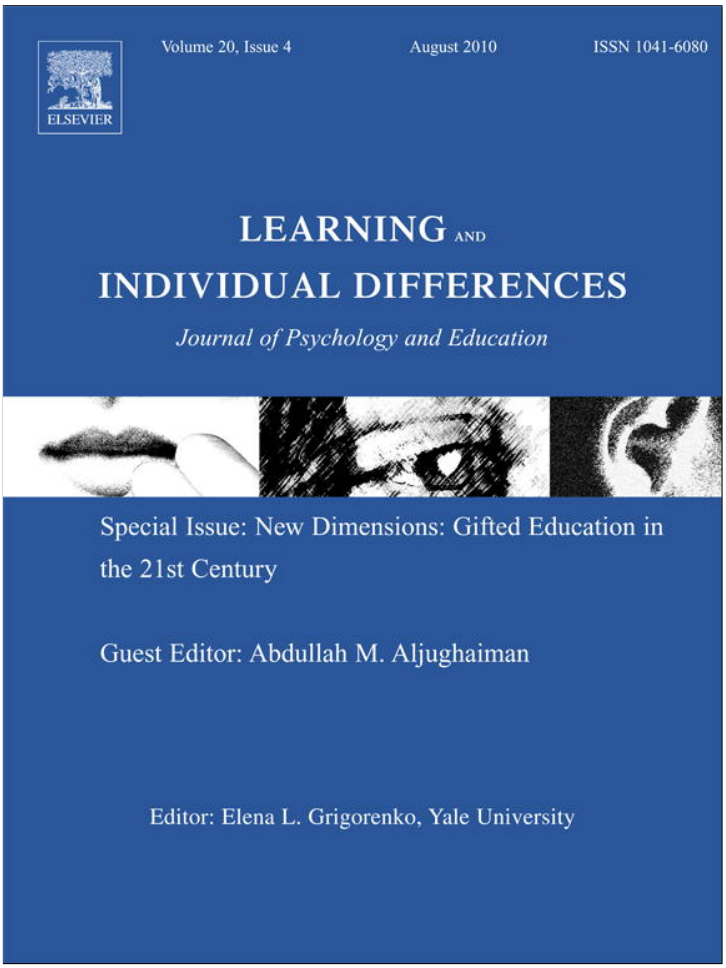

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Identifying young gifted children and cultivating problem solving abilities and multiple intelligences

Ching-Chih Kuo [a,*], June Maker [b], Fang-Liu Su [c], Chun Hu [c]

[a] Department of Special Education, National Taiwan Normal University, 162 Ho-ping East Rd., Sec.1, Taipei 10610, Taiwan
[b] Special Education, the University of Arizona in Tucson, 1430 E. Second Street P.O. Box 210069 Tucson, Arizona 85721, United States
[c] Special Education Center, National Taiwan Normal University, 162 Ho-ping East Rd., Sec. 1, Taipei 10610, Taiwan

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ABSTRACT

The "Enrichment Program for Cultivating Problem Solving Abilities and Multiple Intelligences for Gifted Preschoolers" (PSMIGP program) was the first enrichment program for young gifted children in Taiwan. It was an extra-curricular program that was implemented over a 3-year period. The assessment and curriculum were designed by adapting the main part of the DISCOVER curriculum.

The purpose of this paper was to introduce the identification model and to analyze the participants' performance in problem solving activities and in demonstrating their special talents. To offer enrichment services for gifted young children, the researchers developed an identification model to discover more young gifted children and serve their needs in learning, regardless of the nature of their talents, disabilities, or cultural or socio-economical status. All participating young children were screened in a three-stage process that included both objective and subjective assessments, including checklists, interviews, portfolio assessment, group intelligence tests, observation in the play corner, individual intelligence tests, and structured observation activities. It was also necessary to adjust the standardized test procedure to fit the needs of twice exceptional young children.

In total there were sixty-one preschoolers participated in this three-year program, including eleven twice exceptional children and one child from a new immigrant home. Among these sixty-one preschoolers, eight of them participated in two years of the program; the others only participated in one year of the program. The results of this enrichment program found significant correlations among the measurement scores; the scores of teacher assessment of problem solving abilities also showed that most students performed well on all five kinds of problem solving types. From children's archives, participating children presented scientific thinking characteristics, such as rich knowledge with fascinating imagination and the ability to seek many approaches to solving problems. They were delighted to challenge others and pleased to be challenged. The twice exceptional children also performed well in the program, especially those children with autism whose progress in social skills and group adaptability were remarkable. In sum, the researchers in this program had a belief that children, whether gifted or not, did not get the satisfaction of making progress until they had opportunities to find and develop their potentials.

1. Introduction

From the perspective of developmental psychology, the most crucial stage of brain growth is the first five years of life. Clark (1992) inferred that children's "mental powers" show rapid growth during the two through five year period. "Speech, mobility, and increasing social involvement all add to the fast-paced intellectual development" (Clark, 2008, p. 102). As Restak indicated, "the more complex the experience, the richer the environment, the more complex the brain" (Restak, 1986, p. 91).

The earlier gifted children are identified and provided with appropriate programs, the better their chances of fully actualizing their potential. On the contrary, when young gifted children fail to be challenged during their early years in school and in family situations, they tend to develop negative feelings toward school and develop poor work habits, and then become underachievers (Karnes & Johnson, 1991, p. 268).

In Taiwan, although the "child welfare act" strongly emphasizes provision of early intervention for children with developmental delays, most services are designed to assist in developing children's disability only. So far there is very little evidence of similar programs being developed for the gifted or twice exceptional preschoolers in Taiwan; that is, before our program began, these participating preschoolers had no opportunity to be identified as gifted or not.

* Corresponding author.
E-mail address: kaykuo@ntnu.edu.tw (C.-C. Kuo).

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Many parents responded to the hotline of the Special Education Center, National Taiwan Normal University (NTNU) that their children felt bored and did not want to participate in classroom activities. In view of these factors, the "Enrichment Program for Cultivating Problem Solving Abilities and Multiple Intelligences for Gifted Preschoolers" (PSMIGP program) was proposed as the first experimental program in Taiwan to provide opportunities for gifted preschoolers with and without disabilities to cultivate and nurture their problem solving abilities and multiple intelligences.

Burns, Mathews and Mason (1990) mentioned that due to the public school system's inability to identify and serve intellectually superior preschool children, the academic/intellectual development were stifled. To offer enrichment services for young gifted children, we developed an identification model to discover young gifted preschoolers. Although the main concept of this enrichment program originated from the DISCOVER project, all the assessment tools, curriculum design and teaching materials were constructed by local teachers in Taiwan. The purpose of this enrichment program was to develop children's intelligences and improve their problem solving ability.

The purpose of this paper was to introduce the identification model and to analyze the participants' performance in problem solving and in demonstrating their special talents.

2. Literature review

2.1. Characteristics and needs of learning in young gifted children

Generally speaking, exceptionally gifted children are children who exhibit a higher level of personal maturity in one or more areas than others of the same age or others at similar stages of intellectual and emotional development (Hoeksema, 1982; Gross, 1993). The advanced cognitive abilities of gifted children at four or five may include (a) high verbal ability, such as using words they create and familiar words to create long and complicated sentences, ability to explain more than ten simple terms, and faster responses to questions asked by teachers; (b) high reading ability, such as ability to read before the age of five without direct vocabulary teaching by adults, or having a wide range of reading materials, especially those reading materials for primary school students or adults; (c) high mathematical ability, such as counting by fives and tens and adding and subtracting double-digit numbers; (d) good time perception, such as ability to read the clock and tell the time to the hour and minutes, and to read months, days of the week, and dates from a calendar; (e) good memory, to be able to memorize or recite exactly five or six numbers or terms or more, to memorize by repeating the words or painting, and to have a more complex memory span than peers; and (f) sustained attention, to be able to direct and focus on a specific object or activity for a period of time, and hate being interrupted.

The instruction of young gifted children should be based on an understanding of their characteristics and appropriate assessments. The uneven intellectual, socio-emotional, and motor development of gifted preschoolers should be understood and considered. The assessment should be chosen to benefit the children and facilitate curriculum development to meet their needs (Bredekamp & Copple, 1997; Cukierkorn, Karnes, Manning, Houston, & Besnoy, 2007). Thus the structure of programs for bright preschool children should be based on an understanding of learning (Cukierkorn et al., 2007; Edwards, 2005; Karnes, Shwedel, & Kemp, 1985). Curricular modifications for bright preschool children also need to provide depth and breadth to learning; specific instruction in research skills to facilitate scientific experimentation, and teaching strategies to facilitate learning (Cline, 1998).

2.2. Assessment tools for young gifted children

Identification is the first step to serve gifted preschoolers. Standardized tests such as intelligence tests or achievement tests are most commonly used but are not well suited to identify bright preschoolers. Assessments tools for young gifted children include objective and subjective assessments such as intelligence tests, achievement tests, parent observation, teacher observation/recommendation, and portfolio assessment. Objective assessment is a form of questioning that has a single correct answer. Common objective assessments suited to identify young gifted children are standardized tests like intelligence and achievement tests.

Intelligence tests are most frequently used to assess general intelligence. The common types of intelligence tests are group intelligence tests and individual intelligence tests. Group intelligence tests are often used as a tool for screening, because they are more economical for administering than individual intelligence tests (Assouline, 1997). In general, group intelligence tests are not recommended for the purpose of identifying a child with high ability, because the individual tests provide better information at the higher levels of ability than group tests (Gray, 1980; Sattler, 1992). Essentially, the test ceilings of individual tests are higher. Therefore, group intelligence tests are often used in the first stage of identification while individual tests, which provide valuable separate subtest scores are used as the final identifiers.

An achievement test is a test to measure developed skill or knowledge. Some researchers have found that some young children have higher reading and mathematical abilities even though they have average IQ scores. Thus they argue that educators should use achievement tests as additional measures of young children's ability in reading and mathematics (Sattler, 1992). However, some researchers disagree, stating that achievement tests are not well suited for identifying young gifted children, because (a) the paper-and-pencil tests assess fine neuromuscular development, fine motor skills, and task-appropriate behavior, which is still developing in early childhood; (b) young children are easily affected by temporary changes of moods that may disturb their performance; and (c) the test cannot tap a gifted child's vast accumulated knowledge and skills (Hoeksema, 1982; Shaklee & Handsford, 1992).

Shaklee (1992) suggested that if tests are not the most appropriate methods of evaluating potential or performance in early childhood, then systematic observation and documentation are other choices. Alternative assessments such as parent observation, teacher observation/recommendation, and portfolio assessment have been used for screening for giftedness in many educational programs.

Parent observation also plays an important role in identification of young gifted children, because parents, as the key child care providers, are usually the first persons who see their children's special talents in daily life. Through structured scales, questionnaires, or interviews, parents provide valuable information about "their children in free behavior situations and less restrictive environments than the classroom" (Feldhusen & Baska, 1989, p. 87). Examples are when the child first utters a word, when he or she learned to read by himself/herself, "the child's special interests and hobbies, recent books he or she enjoyed or read, special talents, preferred activities when alone, relationships with others, special problems and/or needs" (Davis & Rimm, 1998, p. 77; Feldhusen & Baska, 1989, p. 87). Parent observation, with valuable information, has become the first stage of identification in most programs for gifted preschoolers in the United States (Burns et al., 1990; Karnes & Johnson, 1991). Most studies showed as well that when parents provide exact information about their young child's development, parent observation will provide more valuable information to identify gifted young children (Fan, 2003; Gray, 1980; Jacobs, 1971; Louis & Lewis, 1992; Pletan, Robinson, Berninger, & Abbott, 1995).

Teacher recommendation is commonly used in identifying gifted and talented students, but most studies have indicated that teacher observation tells less than parent observation (Gray, 1980; Gear, 1978; Hadaway & Marek-Schroer, 1992; Jacobs, 1971). Important reasons are (a) teachers who lack special training are unfamiliar with

the characteristics of young gifted children (Gear, 1978); and (b) young children who do not come from suitable challenging and supportive learning environments cannot easily develop their potentials fully (Karnes & Johnson, 1989).

In view of these factors, teacher training in education of the gifted is emphasized, such as explaining the purpose of identification of young gifted children and the definition of education of the gifted, training teachers to assess and identify children with high ability, providing suitable observation tools, such as standardized scales, and offering challenging courses for children to encourage their high thinking ability, problem solving ability, and ability to develop other potentials (Sattler, 1992; Karnes & Johnson, 1989).

Portfolio assessment is a systematic collection of children's work collected over time, usually drawn from children's performance that shows their thinking ability, problem solving ability, and creativity. Using portfolio assessment not only helps educators to discover multiple intelligences of children but also serves as a tool to identify students from culturally diverse communities, lower socio-economic families, with dual-exceptionalities, or with multiple intelligences (Kingore, 1993).

In sum, although standardized test data can provide information about a child, it cannot give a complete picture of the child's abilities. Thus subjective assessments such as parent interview/observation and teacher observation/recommendation are essential, especially for children from traditionally underserved groups.

2.3. Twice exceptional young children

Researchers indicate that it is difficult to identify gifted children but it is more challenging to identify the giftedness of disabled children because the majority of parents and special education professionals provide early intervention services focusing on their difficulty only; therefore, explorations of intelligence and development of gifted children with disabilities tends to be left behind (Karnes & Johnson, 1986). The uneven development of ability may also result in differences between cognition and emotion, which may cause depression and underachievement (Yewchuk & Lupart, 1993).

Little is known about the most appropriate assessment tools for identifying young gifted children with disabilities. Standardized tests are commonly used to identify young gifted children, but for young gifted children with disabilities, standardized testing fails to show how they deal with test requirements due to their difficulty in communication (Hebbeler, Barton, & Mallik, 2008). Thus, the use of instruments designed for normal children to evaluate the potentials of young gifted children with disabilities is unfair and underestimates their abilities.

Johnson, Karnes and Carr (1997) pointed out that failure to identify and nurture giftedness among the disabled is unfair to them and to society. Whitmore and Maker also stated, "It is obvious that appropriate educational programming for these children could release a very significant amount of creative productivity of great value to society and would also reduce the possibility of economic dependence in adult years, as is often the case when suitable employment cannot be obtained" (Whitmore and Maker, 1985, p. 12).

It is necessary for special education professionals to discover talents of twice exceptional children. The earlier children's talents are discovered, the more likely their teachers can meet their needs and develop their talents. However, adaptations must be made to instruments used to identify gifted children with disabilities.

2.4. Identification model for young gifted children with and without disabilities

Several programs for gifted preschoolers with and without disabilities have been successfully designed and implemented. One example is the project at the University of Illinois developed by Karnes in the1990s. This project was comprised of three programs, the University Primary School (UPS) for children from middle to upper-income families, the Retrieval and Acceleration of Promising Young Handicapped Talented (RAPYHT) serving disabled gifted children, and Bring Out Head Start Talents (BOHST) for children from low-income families. Participants were ages 3 to 5; the participants of the BOHST and RAPYHT programs experienced enrichment opportunities in order to facilitate the development of thinking skills and creativity; while the children attended in the UPS program explored individual topics of interest (Karnes, Manning, Besnoy, Cukierkorn, & Houston, 2005). A parent questionnaire and an individual assessment in the areas of intellectual, fine motor, and creative functioning were used in the screening and identification process (Karnes, & Johnson, 1991).

Another model program for gifted preschoolers was the University Child Development School founded at the University of Washington in Seattle. The *Stanford Binet Intelligence Test* was administrated to assess general reasoning ability, spatial–perceptual reasoning ability, arithmetic skills, short-term memory, and reading skills. Some of the subtests of *Wechsler Preschool and Primary Scale of Intelligence*, *Wechsler Intelligence Scale for Children-Revised*, and the *McCarthy Scales of Children's Ability* were administrated to assess specific intellectual abilities (Shaklee, 1992).

Another example is the program introduced by Burns et al. (1990). The screening process for this program was comprised of three stages: education of the public, general screening, and individualized screening. It is worthy of attention that the first step of the screening process was "informing the general public of the characteristics of gifted preschool children" through "feature articles in newspapers, television interviews on early morning talk shows, television interviews on new programs, speaking engagements for parent and church organizations, in-services for teachers at local preschools, and articled in local magazines" (p. 103).

In short, different identification methods and assessment tools are used due to different purposes of programs for gifted preschoolers. Screening and identification are two processes that are most commonly used, while multiple assessment tools are frequently adopted. It is also essential to assess the synthesized evaluation based on the results of intelligence test, achievement test, checklist, parent interview, teacher observation, and portfolio assessment so as to serve all children, regardless of gifted characteristics, disabilities, or socio-economic status.

2.5. DISCOVER project

Our "Enrichment Program for Cultivating Problem Solving Abilities and Multiple Intelligences for Gifted Preschoolers" was developed based on the DISCOVER (Discovering Intellectual Strengths and Capabilities while Observing Varied Ethnic Responses) Model. DISCOVER was developed by the second author and her colleagues at the University of Arizona in 1987.

Problem solving training is highlighted in the DISCOVER program; this training consists of five different problem types. Descriptions for 5 types of problems are as follows (Shiever & Maker, 1991, p. 120):

- Type 1. Problems are simple and closed; both presenters and solvers know the formula but solvers need to find out the solution by themselves, for instance, $3+4=?$
- Type 2. Problems are simple and closed; presenters know the problem, method and solution, but solvers only know the problem, such as "If there are ten cookies in the box and you ate two of them; how many cookies would be left in the box?"
- Type 3. Problems are known to the solver but more open and complicated, and there are several formulas to solve the problems. Presenters know the formulas and solutions, but solvers need to find them out; for example, use 3, 5 and 2 to write as many mathematical statements as you can.

- Type 4. Problems are made known, but presenters and solvers do not know either the method or solution. For example, what is the best way to cross the river? There is one specific target to solve this type of problem and solvers need to collect the amount of information needed to find possible methods and solutions.
- Type 5. Problems, methods and solutions are not defined clearly for presenters and solvers; the problems are open and complicated; for example, what is the most serious problem human beings face nowadays and how should they deal it with? There is one specific problem; it is acceptable for open explanation by analyzing possible methods and solutions and creating different solutions.

Among the problem types mentioned above, Type 4 and Type 5 are open problems designed for children to solve problems in more open and creative ways.

Howard Gardner's Theory of Multiple Intelligences (1983) in particular has influenced DISCOVER philosophies. When creating DISCOVER, the second author and her colleagues combined and expanded the theory, adding a strong component of problem solving, to form educational instruments that are capable of identifying an individual's unique pattern of natural strengths. The components of DISCOVER were focused on developing multiple intelligences and problem solving abilities.

Gardner defines "a human intellectual competence as needing to entail a set of skills of problem solving enabling the individual to resolve genuine problems or difficulties…and must entail the potential for finding or creating problems — thereby laying the groundwork for the acquisition of new knowledge" (Gardner, 1983, p. 60–61). He describes eight relatively distinct intelligences: linguistic, logical–mathematical, spatial, naturalistic, interpersonal, intra-personal, bodily-kinesthetic and musical intelligence. The intelligences mentioned constitute the ways in which individuals take in information, retain and manipulate that information, and demonstrate their understandings to themselves and others (Veenma & Gardner, 1996; Gardner, 1999). One of the most remarkable features of the theory of multiple intelligences is how it provides eight different ways of teaching or learning. If a teacher is having difficulty teaching a student in the more traditional linguistic or logical ways of instruction, the theory of multiple intelligences suggests several other ways in which the material might be presented to facilitate effective learning.

2.6. Cultivating creative problem solving ability for young children

The crucial period for creativity development is when children are in kindergarten. Ward (1974) early noticed the creativity of children from their daily life activities. While creativity is essentially a form of problem solving, it is important that children be given the opportunity to express divergent thought and to find more than one route to the solution during problem solving work. Teachers and parents can help children learn to think and solve problems in creative ways by respecting their ideas that lead to generating several solutions. Qi (1995) held that children's creativity can be told from their performance, since children always show much interest in what they see and what they perform in their own way.

In Taiwan, Yang (2006) designed a picture book with a Mandala Course for kindergarteners to scrutinize the impact of twelve experimental courses of creativity on young children. She concluded that the performance of the experimental group was significantly better than that of the control group in figure fluency, flexibility, originality, and elaboration. Hsieh (2007) found after young children participated in teaching for creative thinking, they showed better fluency, flexibility, originality and elaboration in creative test results than the control group, too. Su (2007) also found her creative teaching program in painting actually improved children's linguistic creativity and increased children's graphic creativity. The marks of "problem solving fluency", "problem solving flexibility" and "problem solving unique creativity" of the children in the experimental group were superior to those of the children in the control group. When Lin (1999) discussed the influence of creativity problem solving teaching program on children's creativity and problem solving abilities, he showed the significance of the DISCOVER program in developing children's creativity and problem solving ability in progress.

Although several studies have been conducted on the effect of creative teaching to young children, more research is needed on the learning effect of creative or problem solving teaching on gifted young children in Taiwan. While the DISCOVER program focused on problem solving ability, most instruction in Taiwan emphasized logical thinking teaching. To encourage younger children to think and solve problems in a creative and flexible way, the assessment and curriculum in our program were designed by adapting the main part of the DISCOVER curriculum to see whether the enrichment program of DISCOVER could be successful in developing gifted preschoolers' problem solving ability on different problem types.

3. Method

3.1. Identification

Identifying a young child's talent by using only an intelligence test or a single assessment tool is insufficient, especially when we had twice exceptional children being identified. Multiple assessment tools and multiple identification stages were needed to discover their talent. Therefore, for identifying young children who were qualified to participate in our program, a three-stage identification process was used: Screening I, Screening II, and Identification (See Fig. 1). All participating young children were required to be identified through methods used at all three stages of the process.

3.1.1. Screening I

In this first program, we used checklists, interviews, observation, a group intelligence test, and portfolios to screen the children.

3.1.1.1. Completion of the "the Gifted Traits Checklist for Preschool Children" by parents and teachers. "The Gifted Traits Checklist for Preschool Children" (GTCPC) contained 40 items, including many traits that were commonly associated with gifted children, such as cognitive, affective, creative, and others. During the process of application, kindergarten teachers and parents of children were required to fill out the GTCPC to report their children's traits of giftedness. The higher score would be chosen when the scores of parents' and teachers' reports on the GTCPC were different. However, the scoring of both parents' and teachers' editions of GTCPC were not the determining criteria during the screening period.

The purposes of the parent's edition were to provide the opportunity for parents to understand what characteristics of giftedness were examined and to indicate whether or not their children were gifted. Information from the teacher's edition provided the results of long-term observation from their perspectives, which were seen as responsible personnel's references to make up for the limitations of paper-and-pencil tests.

3.1.1.2. Interview with parents. Parents of children who applied were interviewed by researchers of the Special Education Center at the National Taiwan Normal University (NTNU). Each interview took about 30 minutes. For the interview purposes, a semi-structured "Parent Interview Outline" was designed to help interviewers understand the characteristics of the children. Parents were encouraged to indicate clearly their child's strengths and specific performances. The answers from parents also offered an opportunity for us to ask further questions. This Outline, thus, served as a reference only;

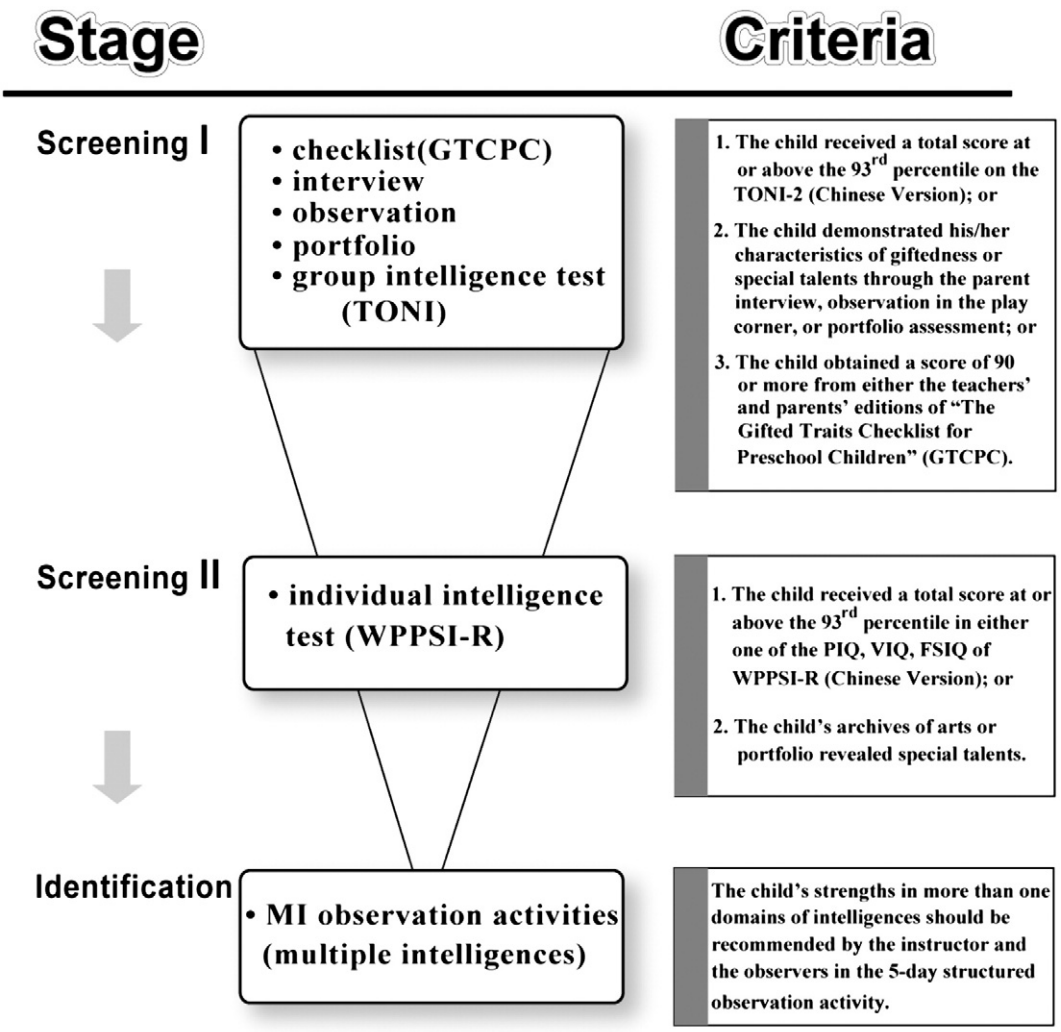

Fig. 1. Identification model.

interviewers asked related questions, designed to gather as much information as possible about each individual child.

3.1.1.3. Observation of children's behaviors. The "Observation Checklist of Children's Self-Initiated Behavior" was designed to observe children's reactions toward new environments and abilities in self-initiated exploration. The checklist contained ten items. The first four items were designed to see if the child in the play corner showed any characteristics of curiosity, keen observation, independence, or cooperation and participation, which are often seen in gifted/talented children. The rest of the items were characteristics of imitation, or lack of concentration, motivation, and social adjustment.

Assistants from the Special Education Center, NTNU, served as observers who were responsible for observing and recording children's on-site behavior as they explored materials while their parents were being interviewed by the researchers. During the identification meeting, these assistants would recommend some "bright" children who showed characteristics of giftedness in the play corner.

3.1.1.4. Group intelligence test. The Chinese version of the Test of Nonverbal Intelligence, 2nd Ed. translated, revised for group administration, and renormed by Wu, Lin, Wang, Hu, & Kuo (TONI 2; Brown, Sherbenou, & Johnson, 1990; Wu, Lin, Wang, Hu, & Kuo, 1996) was administered to all the children who applied to this program. Considering 5-year-old children were not often tolerant of keeping full attention, obeying the rules, and showing persistence (Gray, 1980; Sattler, 1992), these children were first measured in a small group of 2 to 3 persons, while the younger ones and children with disabilities were assessed individually.

3.1.1.5. Portfolio assessment. Portfolio assessment was particularly suitable for identifying children with cultural diversity, social and economically disadvantaged status, and twice exceptional children. To display the distinguishing features of the children, parents in this program were asked to bring with them their children's products (e.g. art work, writing, performances) and to introduce them to the researchers during the interview.

Since most of the products offered by parents were related to the topic of visual arts, music and dance, the portfolios were evaluated by teachers who were experts in the related area. The criteria included items related to basic competence and creative performance. For example, the criteria used in evaluating visual arts portfolios included visibility of the intention, inventiveness, color, craftsmanship, and composition. The criteria used in music portfolios included musical perception and aural ability, musical performance ability, and creativity in music. The criteria used in evaluating dance were ability in rhythm perception, basic dance technique and application, and memory ability.

Most portfolios supplied by parents were scribble drawing made by children at home or at school, rather than paintings for competitions or contests. The following are six examples painted by

participating children, regardless of their talents, disabilities, cultural or socio-economical status. Fig. 2 is a painting by Leo, who is a typically developing gifted child talented in spatial intelligence. His painting has many details, a strong sense of space, and fine portrait. Fig. 3 is another example painted by another typically developing young child talented in linguistic and naturalistic intelligences whose name is Tom. Fig. 4 was created by Jack, who is an Asperger's child talented in both naturalistic and spatial intelligences. Fig. 5 is a portfolio with abundant color and dedicated composition painted by a five-year-old child talented in naturalistic intelligence but who comes from a new immigrant family. Fig. 6, titled "Spirit of Angel" is painted by a hearing-impaired gifted child who came from an economically disadvantaged home. Another example seen in Fig. 7 named "Facial Mask" was created by an autistic child from an economically disadvantaged home. All of these examples showed the non-significant correlation between children's portfolios and their social/economic status. However, the results of this enrichment program showed that these young gifted children with or without social/economic disadvantage status had many talents in various intelligences.

Children who showed special talents and creativity were recommended to move to Screening II; their portfolios were kept along with the assessment results for further identification.

3.1.2. Modification of assessment

The participants in this program were gifted children with or without disabilities. The plan was to accept fifteen gifted children and five gifted children with disabilities each year. When children with disabilities applied to the program, specific concerns according to individual needs were discussed after the parent interview and observation, followed by adaptations of measurement tools if needed. Modification of testing procedures was planned and implemented accordingly.

The methods of assessment needed to be adjusted to fit the needs of children with physical impairments or special emotional needs. For example, for a child with autism, our measurement procedures for the TONI were slightly modified: the shapes of the answers on the first several examples were cut off for the children to play, like solving puzzles. The child with full blindness was not required to take nonverbal tests.

3.1.3. Screening II

Those who passed Screening I were assessed individually on the Wechsler Preschool and Primary Scale of Intelligence—Revised (WPPSI-R, Chinese Version, 2000).

Fig. 2. Painting by Leo, a typically developing gifted talented in spatial intelligence.

Fig. 3. Painting by Tom, a typically developing gifted talented in linguistic and naturalistic intelligences.

In this session, children with full blindness only took the verbal subtests of the WPPSI-R. Some testing items that required vision were not administered.

Children with hearing impairment were first tested on their language comprehension and expression abilities during the observation period to make sure that they had developed enough communication abilities before to take the verbal subtests of the WPPSI-R. In some cases gestures were used to help convey the message to them. However, the VIQ of one deaf child was not taken into consideration or his/her intelligence would have been underestimated due to language problems.

3.1.4. Identification

A 5-day structured observation activity was based on the theory of Multiple Intelligences for the purpose of observing children's abilities in the following six domains of intelligence: logical–mathematical, linguistic, naturalistic, musical, spatial, and bodily-kinesthetic. Inter- and intra-personal intelligences were included within all domains.

Observation activities were designed as planned experiences; namely, an opening high-level thinking activity was designed by teachers on purpose to stimulate children to display the traits of giftedness and talent (Kingore, 1993). Our teachers designed two to six planned experiences (activities) to combine with observation of many traits of giftedness to provide multiple opportunities to allow children to perform their talented behavior. Moreover, teachers were instructed to provide all children chances to orally express and explain their archives in case their thoughts might be underestimated. The observation activities are shown in Table 1. These activities were used for four successive years. During these years, instructors

Fig. 4. Painting by Jack, an Asperger's child talented in naturalistic and spatial intelligences.

Fig. 5. Painting by a child talented in naturalistic intelligence but comes from a new immigrant family.

constantly adjusted the content and observation indicators in the hope of discovering younger children's potentials in intelligences, problem solving abilities, and other social adjustment behaviors.

For each domain, one instructor along with four observers watched children's performances in 2-hour activities. Children's performances were recorded and rated according to pre-planned observation criteria. In each domain, the first 25% of children who excelled were recommended to attend the program.

3.2. Instruments

3.2.1. The Gifted Traits Checklist for Preschool Children (GTCPC)

This checklist and rating scale was designed by Fan (2003). There were two versions; one for teachers and another for parents. Teachers and parents completed the GTCPC separately to screen intellectually gifted children aged 4 through 6. The Checklist contained 40 items, including many traits commonly associated with gifted children, such as cognitive, affective, and creative. The total possible was 120 points. Those children who obtained more than 90 points from either the teachers' GTCPC or parents' GTCPC were recommended to move to Screening II. However, the scoring of both parents' and teachers' editions of GTCPC was not the determining criteria during the screening period. Children who met one of the criteria for Screening I could move to Screening II for further assessment.

Fig. 6. A painting titled "Spirit of Angel" created by a hearing-impaired gifted child from economically disadvantaged home.

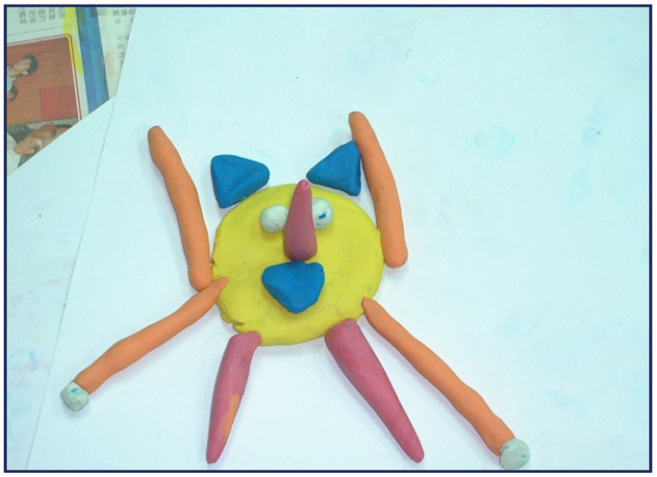

Fig. 7. A painting titled "Facial Mask" created by an autistic child from an economically disadvantaged home.

The ratings from 1 to 3 indicated the degrees to which a child exhibited each of those particular characteristics. A rating of "1" meant that the characteristic was not exhibited at all, while a rating of 3 meant that the characteristic was strongly exhibited. Three examples of the GTCPC are shown in Table 2.

The inter-item consistency (Cronbach α) of the GTCPC was .85–.96. No significant difference in scores was found on the GTCPC between boys and girls. However, a significant difference in the scores was found on the GTCPC (Teacher Version) between age 4 and 5 children ($p<.01$).

3.2.2. Parent interview outline

The "Parent Interview Outline" was a semi-structured outline; the answers to the problems would help the researchers and instructors in understanding the special needs of children during the periods of assessment as well as instruction. This Outline was designed to help understand (a) the purposes and expectations parents had for the program, (b) the talents and/or disability and learning needs of the child, (c) the age of the child when the impairment occurred, (d) any modification of instruction needed to accommodate the child's disability, (e) any difficulties in social adjustment for the child with disability or any extra attendance needed from the teachers, (f) any nurturing or enrichment provided by parents to their child at home to help him/her develop talents, (g) parents' educational beliefs and assistance needed in nurturing their child, (h) parents' understanding and suggestions for the ongoing system of Taiwan's education of the gifted, and any expectations, suggestions, or questions about this program.

3.2.3. Observation Checklist of Children's Self-Initiated Behavior

The "Observation Checklist of Children's Self-Initiated Behavior" was designed to observe children's reactions toward new environments and abilities for self-initiated exploration. The items are shown in Table 3.

3.2.4. Test of Nonverbal Intelligence, 2nd Ed. (TONI-2, Chinese Version)

The Test of Nonverbal Intelligence—Second Edition (TONI-2) (Brown et al., 1990) is a language-free measure of cognitive ability for individuals' ages 5 years old to 85 years, 11 months old that was standardized on a national sample of 2764 people in the same age range. The TONI-2 offers an administration and response format that eliminates language and reduces motor and cultural factors. The basis of all of the TONI-2 items is problem solving and the content is abstract/figural.

Table 1
Observation activities and criteria for evaluation.

	Observation activities	Criteria for evaluation
Logical–mathematical	1: Sharing candy	1. Knowledge of quantities: to list every kind of candy one by one in order to determine a total, 2. Concept of division: (a) to share all candy equally with all students, (b) to share every kind of candy equally with all students
	2: Going to market	1. Basic operations of addition, subtraction, multiplication, and division: (a) to buy one single item by paying tokens and calculate the amount of money by oneself, (b) to buy more than one item with by paying tokens and calculate the amount of money by oneself, (c) to buy different items with different numbers by paying tokens and calculate the amount by oneself
	3: Designing figures	1. Knowledge of different kinds of figures: (a) to know geometric figures such as a circle, square, triangle, rectangle, and others, (b) to know the components of geometric figures and the relationships among components, 2. Creation of geometric figures: (a) to copy the instructor's style of geometric figures, (b) to create different geometric figures by oneself
Naturalistic	1: Knowledge of fruit	1. Interests of observation & curiosity, 2. Discrimination of names
	2: Observation	1. Abilities to operate tools to observe different kind of fruit, 2. Linguistic expression on color and shape of fruit, 3. Usage of five senses to recognize and distinguish different fruit, 4. Association with festivals & seasons by using imagination
	3: Classification	1. Different classification skills: (a) to classify by imitating the instruction, (b) to classify according to instructions, (c) to classify according to the relationship between fruit shape and geometric figure, (d) to find out other methods of classification, 2. Attitudes of participation
Linguistic	1: Big problems in a small story	1. Listening: (a) to pay complete attention, (b) to respond to the story appropriately, (c) to answer problem Type 1 exactly, 2. Linguistic expression: (a) to speak clearly, (b) to express ideas clearly, (c) to express concepts with abundant content and vocabulary terms, 3. Problem solving abilities: (a) to raise a solution for problem, (b) to answer problem Type II reasonably, (c) to answer problem Type III, (d) to answer problem Type IV
	2: What did the pictures show?	1. Imagination: (a) to interpret the content reasonably, (b) to interpret the content creatively, 2. Organization: (a) to arrange a connected series of pictures reasonably, (b) to tell a story logically, 3. Linguistic expression: (a) to speak clearly, (b) to express ideas clearly, (c) to express concepts with abundant content and vocabulary terms, (d) to vary the tone of voice to dramatize the plot
Musical	1: Dancing to the music	1. Moving according to the music
	2: Speaking via rhythm	1. Clap in accordance with the rhythm, 2. Rhythm creation with the body, 3. Play rhythm games
	3: Listening and singing	1. Absolute sense of musical notes, 2. Discrimination between different notes, 3. Imitation of the sounds
Spatial	1: Contest of drawing a person	1. Quantity of figures, 2. Differences in shapes, 3. Expression of shapes
	2: Drawing a story	1. Quantity of figures, 2. Differences in shapes, 3. Expression of shapes, 4. Expression of movement, 5. Expression of themes, 6. Expression of spatial arrangement, 7. Colors of symbol or expression
Bodily-kinesthetic	1: Performance on moving skills	1. Performances of different ways of moving, 2. Balance and steadiness of the body
	2: Performance on steady skills	1. Stand on one leg, 2. Imitation of three figures
	3: Performance on controlling skills	1. Exactness of throwing balls, 2. Controlling a ball using different parts of own body

TONI-2 (Chinese Version) was revised and normed on a Taiwanese population (Wu et al., 1996); it is appropriate for use individually with young children ages 4 through 6 and also children with disabilities. Children from above 7 years old may take the test individually or in a group.

There are two forms, Form A and Form B. Each form contains 55 items, assessing children's abstract figure reasoning ability. The Cronbach α for the TONI is .95–.96 and the test–retest reliability is .560.

The TONI-2 was standardized on 11,200 children (5600 for Form A and 5600 for Form B), 400 in each of 14 age groups from 4 to 18 years.

3.2.5. WPPSI-R (Chinese Version, 2000)

The Wechsler Preschool and Primary Scale of Intelligence—Revised (WPPSI-R; Wechsler, 1989) is an individual test that does not require reading or writing, and is intended for children ages 3 years through 7 years, 3 months old.

The WPPSI-R contains 12 subtests, 6 in the Performance Scale and 6 in the Verbal Scale. Five of the six subtests in each scale are designated as the standard subtests. They are Object Assembly, Geometric Design, Block Design, Mazes, and Picture Completion in the Performance Scale, while Information, Comprehension, Arithmetic, Vocabulary, and Similarities are in the Verbal Scale. The optional subtests are Animal Pegs in the Performance Scale and Sentences in the Verbal Scale.

The WPPSI-R employs a Deviation IQ (M = 100, SD = 15) for the Verbal, Performance, and Full Scale IQS and scaled scores (M = 10, SD = 3) for the subtests. A raw score is first obtained on each subtest and then converted to a scaled score within the examinee's own age group through use of a table in the WPPSI-R manual.

The WPPSI-R was revised and normed on a Taiwanese population in the year 2000. The split-half reliability of the verbal, performance, and full scales are .94, .89, and .95. The test–retest reliability for a period of approximately 3 to 7 weeks of the verbal, performance, and full scales are .88, .89, and .91. The concurrent validity with WISC-R of the verbal, performance, and full scales are .68–.80.

The WPPSI-R was standardized on 900 children, 50 boys and 50 girls in each of nine age groups from 3 to 7 years.

Table 2
Examples of the Gifted Traits Checklist for Preschool Children (GTCPC). Use the checklist below to reflect on the traits associated with gifted children, such as cognitive, affective, and creative. (Tick if anything in the sentence applies to the child.) The ratings from 1 to 3 indicated the degrees to which a child exhibited each of those particular characteristics. A rating of "1" meant that the characteristic was not exhibited at all, while a rating of 3 meant that the characteristic was strongly exhibited.

Examples of the GTCPC	Rating		
	1	2	3
1. He/She has higher learning ability; e.g. when learning new things, he/she			
(a) is slow to learn.			
(b) sometimes learns quickly, but sometimes does not.			
(c) always learns quickly.			
2. He/She has a good memory; e. g. when memorizing the name of a person or a thing, he/she			
(a) memorizes very quickly and efficiently.			
(b) needs to memorize through repetition.			
(c) usually quickly forgets and need reminders.			
3. He/She can focus on something interesting for a long time; e. g. when he/she is doing something interesting, he/she can maintain his/her focus for			
(a) less than 20 minutes.			
(b) 20–30 minutes.			
(c) more than 30 minutes.			
Total			

3.2.6. Observation activities

The observation activities were designed to observe children's abilities in six domains of intelligence: logical–mathematical, linguistic, naturalistic, musical, spatial, and bodily-kinesthetic. Inter- and intra-personal intelligences were included within all domains. For every domain, one instructor along with four observers recorded children's performances in 2-hour activities. Children's performances were rated according to pre-planned observation criteria (see Table 1).

The profile of multiple intelligences of each child was explained to parents after the final selection decision was made. Even if the child was not qualified to join our program, the information related to home enrichment was offered so that parents would know ways to develop children's potential.

3.3. Identification criteria

In this program, both objective and subjective assessments were used: checklists, interviews, portfolio assessment, group intelligence tests, observation in the play corner, individual intelligence tests, and structured observation activities. The purpose of this program was to explore and nurture children in various areas of multiple intelligences; that is to say, children's performance on an intelligence test was not the main criterion for identification. Moreover, it was necessary to adjust the standardized test procedure to fit the needs of gifted children with disabilities and the procedures should not be the same as for gifted children without disabilities. Recommendations from parents' and teachers' observation as well as portfolio assessment to discover children's specific talents were also our main concerns during identification in this program.

Table 3
The Observation Checklist of Children's Self-Initiated Behavior.

□ The child takes any object from the corner and plays with it or reads it without direction from an adult.
□ The child keeps on asking questions about the objects in the environment.
□ The child does not want other people to tell him/her what to do.
□ The child likes to join other children's activities.
□ The child observes what other children do and then imitates the same activity.
□ The child changes from one activity to another, never focusing on one activity for a long period of time.
□ The child needs encouragement from adults to continue with his/her activity.
□ The child often needs attention from adults.
□ The child frequently runs to his/her parents or wants to know where his/her parents are so that he/she can play with ease.
□ The child cries for his/her parents.

3.3.1. Criteria for Screening I

To be successful in Screening I, a child needed to meet at least one of the following criteria:

1. The child received a total score at or above the 93rd percentile on the TONI-2 (Chinese Version).
2. The child demonstrated his/her characteristics of giftedness or special talents through the parent interview, observation in the play corner, or portfolio assessment.
3. The child obtained a score of 90 or more from either the teachers' and parents' editions of "The Gifted Traits Checklist for Preschool Children" (GTCPC).

3.3.2. Criteria for Screening II

Children who met one of the following criteria were qualified to participate in observation activities:

1. The child received a total score at or above the 93rd percentile in either one of the following four areas: performance IQ (PIQ), verbal IQ (VIQ), full score IQ (FSIQ) of WPPSI-R (Chinese Version).
2. The child's archives of arts or portfolio revealed special talents, even though his/her IQs did not meet the criteria listed above.

3.3.3. Criteria for identification

After every observation period (for every domain), the instructor and the observers discussed the performances of the children before they made final recommendations. Approximately six children (or one fourth of the number of children assessed) from every domain were recommended for the program. Since many children showed strengths in more than one domain, their parents preferred their children to choose the naturalistic intelligence area in the "Talent Development" course because naturalistic abilities are difficult to observe and develop in kindergarten children. Another reason was that parents in Taiwan often preferred their children to develop talent in logical–mathematical or naturalistic intelligence rather than other intelligences.

3.4. Participants

Table 4 shows the numbers of children who participated, and their intelligence areas. The reason why no child attended the bodily-kinesthetic domain for the first year was that parents preferred their children to develop talent in logical–mathematical or naturalistic intelligence rather than bodily-kinesthetic intelligence.

Totally there were sixty-one preschoolers participated in this three-year program, including eleven twice exceptional children and one child from a new immigrant home. Among these sixty-one preschoolers, eight of them participated in two years of the program.

The numbers of children who applied to the program for each year and the number who were screened out in each step are as follows: forty preschoolers applied to the first year of the program but twenty-one were screened out. There were nineteen preschoolers in the first year of the program, including one child with autism and one with hearing loss. Among these nineteen preschoolers, two children of four years old continued to participate in the second-year program but they chose different areas in the two years; one chose the naturalistic area in the first year and linguistic in the second-year program, while the other chose musical and next, naturalistic to develop a different strength.

The second-year program included twenty preschoolers and two returning preschoolers. Among these twenty-eight preschoolers,

Table 4
Numbers of participating children and their talents.

Year	Year 2003			Year 2004			Year 2005		
Talent	Male	Female	Total	Male	Female	Total	Male	Female	Total
Naturalistic	4	0	4	1	3	4	6	2	8
Bodily-kinesthetic	0	0	0	2	1	3	1	1	2
Spatial	4	2	6	4	1	5	1	3	4
Musical	2	1	3	0	1	1	2	2	4
Linguistic	2	0	2	3	3	6	4	2	6
Logical–mathematical	4	0	4	3	0	3	3	1	4
Total	16	3	19	13	9	22	17	11	28

there were five twice exceptional children with hearing loss, autism, Asperger's syndrome and visual or learning impairment.

In the third year of the program, one hundred and twelve preschoolers applied but ninety were screened out. Six preschoolers, including four typically developing gifted children and two twice exceptional children, from the second-year program continued to participate in the third-year program and all of them chose different areas to develop different potentials. That is, twenty-eight preschoolers were in the third-year program, including six twice exceptional students with autism, ADHD, emotional or visual impairment. Which area the returning students would choose depended on the recommendation from instructors during the observation activity.

These children's assessment results are shown on Table 5 and the correlations among the scores are listed in Table 6. In Table 5, the means and standard deviations for the spatial domain are missing because the instructors gave only ranks instead of scores. From Table 5 one can see that the IQ scores on the WPPSI-R increased over the years. The staff speculated that as the program was known to more parents over the years, more children with higher IQs applied for the program. Thus, the researchers had more children to choose from, which led to the results.

In Table 6, we can see that parents' ratings of their children correlated significantly with that of teachers ($r=.743$, $p<.001$). This might mean that both parents and teachers shared a common understanding of the particular child they rated. The parents' ratings show significant correlations with the FSIQ ($r=.390$, $p<.001$), VIQ ($r=.490$, $p<.001$), linguistic ($r=.438$, $p<.001$), logical–mathematical ($r=.339$, $p<.01$), naturalistic ($r=.479$, $p<.001$) and bodily-kinesthetic ($r=.429$, $p<.001$) scores. One could speculate that the parents were keener in observing their children's abilities, for they spent much time together. The teachers' ratings show significant correlation with the FSIQ ($r=.305$, $p<.05$), VIQ ($r=.435$, $p<.01$), linguistic ($r=.460$, $p<.01$), and bodily-kinesthetic ($r=.380$, $p<.01$) domain scores. The staff believed that the kindergarten teachers were keener in observing verbal expression than nonverbal ability. The naturalistic abilities are difficult to observe in kindergarten children.

As for the IQ scores, the TONI scores correlated with FSIQ ($r=.259$, $p<.05$), PIQ ($r=.372$, $p<.01$), which was understandable for the two intelligence tests were both non-verbal. The three IQ scores of WPPSI-R (PIQ, VIQ and FSIQ) were highly correlated with one another. Both the FSIQ and VIQ correlated with linguistic, logical–mathematical, naturalistic, and bodily-kinesthetic scores but not with music scores, which indicated that WPPSI-R was more related to the observation activities of linguistic and logical–mathematical domains. Lastly, musical ability as measured during the observation period only correlated with the TONI ($r=.316$, $p<.05$) and bodily-kinesthetic domain scores ($r=.489$, $p<.001$).

The intelligence areas and assessment results of twice exceptional preschoolers are shown in Table 7. While some preschoolers had lower IQ scores than those without disabilities, their special talents still could be found from their portfolios or teachers' observations and recommendations.

Table 5
Descriptive statistics for children who entered the program.

Year	2003			2004			2005		
	N	*M*	SD	*N*	*M*	SD	*N*	*M*	SD
Parent	19	102.79	12.38	20	100.95	10.41	28	98.14	10.90
Teacher	15	102.60	11.25	14	96.57	10.61	23	95.13	12.43
TONI	19	125.26	9.95	18	125.22	13.45	24	126.46	15.58
FSIQ	19	117.11	16.83	18	126.22	12.55	27	132.67	9.23
PIQ	19	121.47	13.70	18	127.89	12.09	27	130.48	7.95
VIQ	19	109.74	20.22	19	119.32	16.35	28	127.46	14.21
Linguistic	19	100.25	15.76	20	101.50	16.65	28	100.17	16.00
Logical–mathematical	19	101.79	16.12	20	100.67	15.89	27	102.00	15.61
Naturalistic	19	102.70	14.55	20	103.77	14.28	28	102.75	13.29
Spatial	19	2.74	1.28	20	91.73	33.28	27	100.51	15.93
Musical	19	101.97	15.94	19	104.29	15.57	25	103.86	14.37
Bodily-kinesthetic	18	103.26	13.89	20	103.28	13.24	26	103.42	15.52

3.5. Teachers and training

To offer high quality instruction, teachers, observers and assistants cooperated to create a good learning environment.

3.5.1. Teachers

Teachers in this program were chosen from teachers who had taken part in seminars and symposia about problem solving and multiple intelligences held by the Special Education Center, NTNU. After being selected, teachers who participated in this program included (a) researchers from the Special Education Center, NTNU; (b) senior teachers in classes for gifted students in high schools and primary schools; and (c) teachers in kindergartens. In addition, professors from related fields of preschool education or gifted education, and senior teachers in kindergartens were invited as consultants to give suggestions for identification, curriculum design, environmental design, and other important aspects of the program.

Two crucial trainings were held for all participating teachers. First, they were required to participate in a three-day seminar on multiple intelligence and curriculum design, to submit reports on curriculum design after the seminar, and to attend a one-day knowledge sharing meeting. Then they were asked to participate in a five-day seminar on DISCOVER, followed by submitting a practical report on an individual case study of a child, and attend a two-day knowledge sharing meeting.

3.5.2. Observers

Observers in this program included undergraduate students and graduate students of the Department of Special Education, NTNU, who had taken courses in a teaching practicum in education of gifted students. Observers were asked to discuss the details of observation with the specific domain teachers half an hour before they started to observe, take records of children's responses, and give assistance in each and every class. Observation in class involved children's problem

Table 6
Correlations among the variables for children who entered the program.

	Parent	Teacher	TONI	FSIQ	PIQ	VIQ	Linguistic	Logical–mathematical	Naturalistic	Spatial	Musical
Teacher	.743***										
TONI	−.093	−.043									
FSIQ	.390**	.305*	.259*								
PIQ	.041	−.086	.372**	.685***							
VIQ	.490***	.435**	.121	.926***	.367**						
Linguistic	.438***	.460**	.233	.403**	.088	.486***					
Logical–mathematical	.339**	.259	.175	.452***	.333**	.415**	.298*				
Naturalistic	.479***	.228	.141	.371**	.200	.374**	.367**	.378**			
Spatial	-.100	-.260	-.030	.351**	.232	.329**	.067	-.026	.026		
Musical	.098	.159	.316*	.182	.168	.124	-.068	.142	.211	.017	
Bodily-kinesthetic	.429***	.380**	.090	.343**	.049	.424**	.280*	.152	.568***	.000	.489***

***$p<.001$, **$p<.01$, *$p<.05$.

solving ability, special talents and social adjustment. For those children with disabilities, such as blindness, hyperactivity or autism, observers were encouraged to give assistance and help manage their behavior. After class, observers also were required to put photos and records in order for the portfolio assessment.

3.5.3. Assistants

Research assistants in the Special Education Center, NTNU, served as assistants in this program, arranging meetings and teaching resources, environmental design, preparation of teaching materials and meals, and other assistance as needed.

3.6. Curriculum design

The whole-day enrichment activities on Saturdays were scheduled. “Exploring DISCOVER” and “Group Activity” were held in the mornings, which all children attended. “Talent Development” and “Self-choice Activity” were planned in afternoons, which were designed differently according to children's intelligence strengths and interests. The curriculum design of our PSMIGP program can be seen in Fig. 8.

“Exploring DISCOVER” combined multiple intelligences and problem solving abilities taught for all students and designed by teachers, while the course of “Group Activity” provided opportunities for children to interact and play. The course of “Talent Development” classes was a small group course, for one to eight children in each group. There were six different areas in this course: logical–mathematical, naturalistic, linguistic, musical, spatial, and bodily-kinesthetic, taught in groups and designed by teachers. “Self-Choice Activity” allowed each preschooler to choose any learning corner they preferred to explore their interests and progress in self-choice and problem solving learning. Each learning corner included five types of problems; children were given reinforcement after they succeeded in the problem solving activity.

Curricula for this program were designed by domain teachers. Six themes were woven into the target goal for this program; they were relationships, patterns, change, individuality, cycles, and environment. These themes came into existence after referring to Professor Maker's DISCOVER program, seeking opinions from preschool teachers, holding meetings for consultants and domain teachers, and finally reaching agreement. Additionally, there were six units of integrated teaching in the program. These six units, in chronological order, were “Colors and Shape,” “Others and Me,” “Growing-up,” “Festival,” “Four Seasons,” and “Family.” Each lesson lasted for 4 weeks.

Modification of curricula were planned and implemented according to the teaching experience from the first-year program, children's responses and needs, and differentiated curriculum design to fit the learning needs of children with dual exceptional or different ability. Fully developed assessment methods and criteria were used to evaluate children's performance in five types of problems and eight intelligences. Table 8 is one example of the “Festival and Holiday” theme designed by Dr. Wu.

Consider the curriculum design named “Rousseau's Forest” in the unit “Colors and Shape” as an example. The instructors designed activities for problem Types II through IV. Problem Type II was to use shape and color features to distinguish different plants in Rousseau's paintings. Problem Type III was to tell shapes and colors of common plants in ordinary life. Problem Type IV was to think outside the box and draw various kinds of plants, while another Type IV was to practice a color mixing exercise to draw green plants of different species. Scoring criteria from 1 to 5 were designed. In this course, the instructor introduced paintings of Henri Julien Félix Rousseau, a French Post-Impressionist painter. Preschoolers were encouraged to make creative paintings through cognitive learning and artistic stimuli in varied multimedia types. The instructors guided preschoolers to make creative paintings and provided suggestions on quantity and quality based on observation records, preschoolers' paintings, and class performance.

Table 7
Assessment results of children with disabilities.

Year	Age	Impairment	Checklist		TONI	WPPSI-R			Observation (Strength)	
			P	T		FIQ	PIQ	VIQ	Parent	Teacher
2003	5.11	Hearing	95	75	121	118	79	94	Linguistic, spatial	Spatial
2003	5.8	Autism	62	87	117	91	46	67	Musical	Spatial
2004	5.0	Asperger	77	70	134	112	134	89	Logical–mathematical, spatial, musical	Spatial
2004	5.3	Language	84	83	108	91	124	72	Spatial	Spatial
2004	5.6	Blind	95	96	112	–	–	119	Linguistic, musical	Logical–mathematical, musical, bodily-kinesthetic
2004	5.1	Hearing	101	93	104	117	113	118	Linguistic, spatial	Linguistic, science, art
2004	4.8	Visual	103	102	150	125	111	131	Linguistic, naturalistic	Linguistic, naturalistic, musical, bodily-kinesthetic
2004	4.8	Autism	87	–	116	132	131	126	Logical–mathematical, spatial, musical	–
2005	5.4	Autism	65	73	136	117	123	108	Spatial, Musical, bodily-kinesthetic	Musical
2005	5.4	Emotional	102	–	105	132	141	118	Spatial	Spatial
2005	5.8	ADHD	110	101	134	134	131	129	Linguistic, logical–mathematical, spatial	Bodily-kinesthetic, logical–mathematical, naturalistic

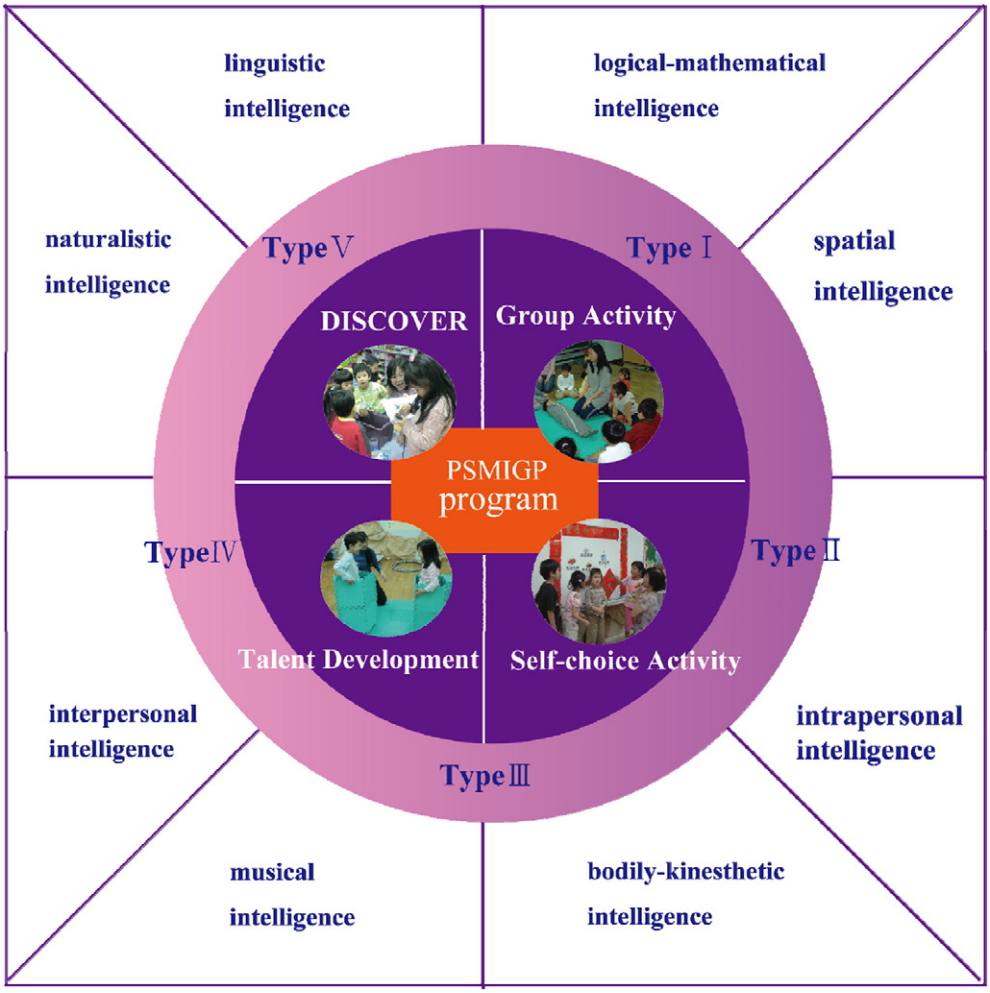

Fig. 8. Curriculum design of PSMIGP program.

The teaching materials were compiled in the first year of the program, that is, from 2003 to 2004. After that time, teachers modified the units according to children's responses. The individualized instructional design was added to meet the learning needs of children with disabilities and children with different talents.

4. Results and discussion

In this paper, children's performance in problem solving in five different types of problems and their intelligence development were assessed.

For each child, the researcher collected all the related data: from the classroom performances, periodical assessments, students' observations recorded in classes, and works of art or archives. The observation records regarding the students' problem solving ability in every lesson were emphasized highly in the program.

4.1. Children's performance on problem solving abilities

The changes in children's scores in problem solving performance in six units were analyzed to understand better the behavior changes of students after participating in the program.

4.1.1. Shift analysis of individual students' problem solving performance

To examine the effect of participation in the program on children's problem solving ability, the author analyzed the trends of students'

Table 8
Example of "festivals and holidays" theme (Designer: Wu, Shumin).

Class: nature science activity: holidays and foods				
Objectives	Content	Type of problems	Involved intelligence	Resource
1. Understand Chinese holidays and traditional seasonal holidays.	1. Pre-activity: Introduction of important Chinese holidays.	TypeII	Linguistics	Dial
2. Understand the origin and regulations of traditional seasonal holidays.	2. Introduce the regulation of 24 traditional seasonal holidays.	TypeI	Linguistics	Relative materials for creating a dial.
	3. Discuss how to regulate in the old time with no watch.	TypeV	Linguistics	
	4. Introduce how the ancients set up the names, the meaning, and order of 24 traditional seasonal holidays.	TypeI	Linguistics, naturalistic	
	5. Create a dial to measure the change of time.	TypeII	Spatial	
	6. Record the change of shapes during one week.	Type III	Naturalistic	

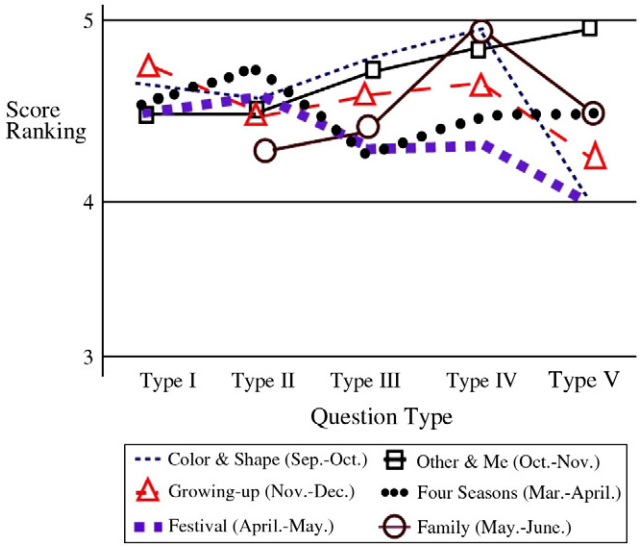

Fig. 9. Shift of Ming's scores in five types of problems in the musical field.

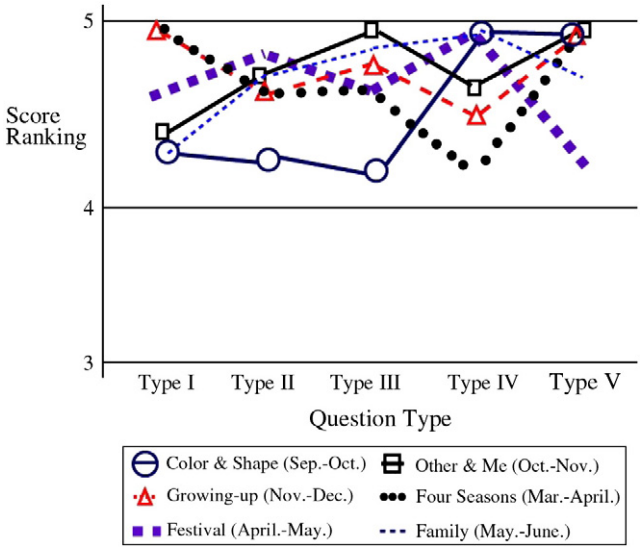

Fig. 10. Shift of Ted's scores in five types of problems in the linguistic field.

scores in problem solving performance in six units. The following are two examples.

Ming is a blind child highly talented in music. The scores she received in every problem type in the musical field in one year ranged from 4 to 5 (see Fig. 9). In the first semester of that year, her performance in units of "Color and Shape," "Others and Me," and "Growing-up" could be found from the curve: high scores in problem Type 1, Type 2, and Type 3, better scores in Type 4 but lower scores in Type 5. In the second semester of that year, in "Four Seasons" and "Festivals" as examples, she had higher scores in Type 1, Type 2, and Type 3 than in Type 4 and Type 5. But in the lesson unit of "Family," she received higher scores in Type 4 and Type 5 than in Type 2 and Type 3. Generally speaking, Ming performed well in every problem type. She performed better with surprising creativity in the last lesson. For a period of time she has recorded her own composed songs that were connected to her life.

Ming is deficient in sight, but is passionate and popular among the students and teachers in this program. Just like other gifted children, she was enthusiastic for every activity, good at performing and demonstrating, eagerly involved, with her own ideas and creativity, actively cooperating and asking for help when needed during group activities and peer interaction. Her high self-expectations, self-discipline, and strong enthusiasm about music were fully developed in the course, "Talent Development." She used her auditory and tactile senses to memorize every song, perform finely, and even add her creations. At this stage we offered the opportunity for her to learn music Braille, and hope her potentials can develop fully. Ming showed her infinite creativity and always surprised all members in the program. She composed songs and made recordings from time to time. In our program, we did not teach her how to compose; but rather, we provided opportunities for her to create and to fulfill her potential (Kuo & Hu, 2004). Nowadays she plays a role as a lovely angel, always attending activities and playing music with her enthusiasm, creativity, and imagination to deliver her love to handicapped children or homeless elders; music becomes vital in her life.

Ted, a 4-year-old boy, is highly talented in linguistic abilities. One can see his performance scores in five types of problems in the linguistic field from Fig. 10. His scores were all above four across the 5 types of problems, especially in "Others and Me", "Growing-up", and "Family."

In the unit "Growing-up" of the "DISCOVER" course, when making "My career draft", Tom was given two sheets of paper in the beginning, yet he did not limit his thinking to the size and space of the paper. He would ask for scissors and glue to present them by patching up the pieces when what he wanted to express exceeded the space of the paper. When the teacher asked for volunteers to go on stage to explain their own works, Ted spelled out that the concrete goal and a ball in the picture is his dream for Junior High School, and asked everyone to guess what that was. It turned out that Tom had already listed "a professional football player" among his career pursuits. In addition, Tom also added that there were not only good things in life, but also lots of accidents might happen, which he represented with many messy red-lines. From such presentations and expressions we could see his masterful control of abstract concepts (Jen et al., 2004; Kuo, 2006).

Compared these two children, although one is a full blind girl and the other is a normal child, they performed well in all types of problem solving ability. From their works, we can see many traits of giftedness such as logical thinking, superior memory ability, abundant knowledge, vivid imagination, and high creativity.

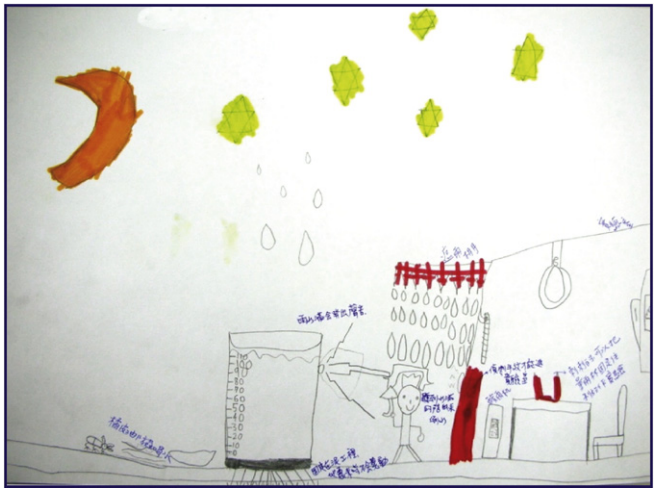

Fig. 11. The rain collector designed by Ken.

4.2. Children's performance on special talents

All the products and works of children resulting from this program were assembled to evaluate children's performances and improvement in their talent development and creativity over time. Along with scores on solving five types of problems, qualitative descriptions of children's behavior based on portfolio assessment was completed. In the following analysis, several artworks from different children are introduced to unveil children's unique thinking and talent.

4.2.1. Ken — talented in naturalistic intelligence

The rain collector designed by Ken is shown in Fig. 11. It would beep while the water was full to alert the researcher to dump the water. The thoughtful Ken attached with the collector an earthquake-proof stabilizer on the bottom and orange peel oil for worm prevention. Also, there was a canopy on the entrance to the lab and a fingerprint examiner set up for entering the yard. An acid rain detector was built inside the lab to examine the quality of the rain. These designs were the best demonstration of Ken's knowledge in naturalistic as well as elaboration of his thought.

4.2.2. Leo — talented in spatial intelligence

Leo is an active child full of vigor. The picture of his "Spring Goddess" was rich in bold colors; the entire picture was permeated with a vivacious atmosphere. The details observed were provided in different varieties, such as small rivers, near and distant mountains, flowers in different shapes, all of which indicated the painter's skills in observation and fluent expression. Leo added his own interpretation to the picture, which made his picture more creative and interesting. "The Tears of Spring Goddess" is made up of the rivers that serve to irrigate the land, which was indeed extremely rich in creativity and amusing effect (Jen et al., 2004; Kuo, 2006).

4.2.3. Kevin — talented in spatial intelligence

"The Colorful House" took Kevin two hours, without a break to complete. The material that the teacher offered was clay, which could be colored by rubbing different watercolors into the clay. To maintain the integrity of the clay, Kevin left part of the clay un-rubbed, which he intended to color with his own hands. Besides, to polish the corner of the house, he himself searched for cutting tools in the class. The colorful house was so elaborate that Kevin even took into consideration the weight limit of the roof. Each part of the house had its own suitable function, and the entire concept of structure was very complete (Jen et al., 2004; Kuo, 2006).

4.2.4. Jack — talented in naturalistic intelligence

As a child diagnosed with Asperger Syndrome, Jack displayed his abundant knowledge and creativity by painting. In the theme "Little fish's mountain climbing," Jack introduced Taiwan by drawing the Formosan Landlocked Salmon, one of the endangered species of fish in Taiwan, growing up from eggs to big Salmon and returning to the sea. In his painting he also pointed out the characteristics of the environment of Formosan Landlocked Salmon, which had a chill in the air. Jack described how the bodies of the Formosan Landlocked Salmon changed in color as the weather and temperature changed when they climbed. The "snow line" that Salmon encountered was labeled clearly on "Little fish's mountain climbing", on "Little fish's mountain downhill", the painter explicated the process of going downhill and the colors of bodies of the Formosan Landlocked Salmon changed back to the original color (Kuo, 2007).

4.2.5. Larry — talented in spatial intelligence

Larry, another boy who had autism, whose language capability was inferior to other children, usually demonstrated his unique creativity and imagination via his artwork. The teacher in an art class once presented a picture, on which was a human visage cut into geometric figures like a puzzle. The children were asked to mold from clay the original face of the picture. Larry completed all the above procedures very quickly; he even took the trouble to mark the dark eyeballs in the exact location, which other children failed to do. Also, Larry succeeded in manifesting a special 3-D effect with the nose on his work, while the works produced by others tended to be flat. He demonstrated his attentiveness in this work, and solved the problem according to the teacher's instructions. The originality observed in Larry's work was definitely worth noting and encouraging.

In lecture-oriented classes, Larry often had problems paying attention to learning; yet in creation-oriented classes, he could always be engrossed in his own art creation. Once in a DISCOVER Course, when the teacher asked the children to design freely the houses they like, Larry began with his attention focused on observing the "Sample House" provided by the teacher, and then he became engaged in his own design. In the process of creation, the first part that Larry finished was the partition of the house, which meant the main structure. He then followed by presenting the "interior design" part. Consequently, the teachers observed that he would go through deliberation and planning before setting off to solve problems. The work done by him fully presented the essential interior elements of a house as expected: bookshelves, tables, beds, an air-conditioner, windows and so on. One point worth mentioning was that the partitioning and the stair part of the house were made from the leftovers of other classmates. When his work was finished, Larry could not help but yell, "Larry is great! What Larry did is so beautiful!"

Although Larry did not interact much with his classmates, he still paid a good deal of attention to his surroundings. For example, once, he mumbled to himself, "Faith is absent, Jung is absent, and Liang is also absent." We checked and found that the kids he named were indeed absent. Besides, his progress and creativity often brought us countless surprises. Here is another example: when the class was designing the MRT train, every child portrayed the silhouette of the train. Only Larry, on the contrary, took an aerial view, the distinctiveness of which was really quite impressive.

The above-mentioned children's works were simply parts of files in this program. In the instruction of problem solving abilities, the researchers discovered that children profusely displayed their creativity in their works, the objective this program emphasized—the value of free thinking. For fluency, children showed their smooth and free thinking and finished their works in a short period of time. For flexibility, many children used various methods and skills to achieve their works and were not constrained by a single way. For uniqueness, many children had their unique ways of thinking and extraordinary ideas. One cannot help admiring their imagination. For elaboration, they unquestionably exhibited exquisite thinking in their works. These children also displayed their patience, perseverance and desire for perfection during the process of creation.

Based on the observation of these young children' performance, the researchers found, through problem solving teaching, that young gifted children did show many cognitive characteristics, such as various interests, concentration on the tasks, and willingness to accept the challenge of the different kinds of tasks.

5. Conclusion

This enrichment PSMIGP program won participating young children's favor in the three years of implementation. Compared to other identification models for young gifted children mentioned above, our identification practices by using a three-stage identification process and multiple assessment tools helped to discover more young gifted children and serve their needs in learning, regardless of their talents, disabilities, or cultural or socio-economical status. Because it was the first experimental program in Taiwan, most parents found that children were so excited to attend courses that they got up voluntarily on Saturday mornings and were coming in a

hurry to attending the courses. The reasons why children loved this program were inclusive of flexible teaching, abundant knowledge, encouragement of abilities and tapping potentials. The researchers in this program had a belief that children, whether gifted or not, did not get the satisfaction of making progress until they had opportunities to find and develop their potentials.

Our children presented scientific thinking characteristics, such as rich knowledge with fascinating imagination and the ability to seek many approaches to solving problems. They were delighted to challenge others and pleased to be challenged. The children with disabilities also performed well in the program, especially those children with autism whose progress in social skills and group adaptability were remarkable. This result showed the importance of providing opportunities for gifted children with disabilities to discover and develop their potential. Sometimes they performed better than did gifted children without disabilities. The inclusive education in this program was highlighted as well. Gifted children without disabilities learned how to recognize, respect, and help other children with disabilities. We were gratified with that no parent or child complained of inconvenience or interruption caused by children with disabilities.

Through using checklists, interviews, observations, intelligence tests, portfolio assessment and structured observation activities together, we identified very gifted and talented young children to join our program. Significant correlations were found among the measurement scores. The scores of teacher assessment of problem solving abilities showed that most students performed well on all five kinds of problem solving types. What is more, current related studies expressed a favorable opinion for this program and participating preschoolers. For example, Lin (2005) found that these participating children were happy to develop intelligence by their talents, and their ways, especially when the instructors used whole language strategies to improve their learning. Jen (2005) investigated the verbal characteristics of these preschoolers in her thesis. She found that participating preschoolers performed better in reading or verbal activities than normal preschoolers. Also, many preschoolers were observed for possessing at least two talents. The main findings of this study, the excellent performance and progress of children, verified that this program worked very well, including the implementation of inclusive education. We have much hope that more students with special needs could learn together with regular students.

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