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愛媛大学「キッズ・アカデミアーサイエンスー」講座の開発と実践
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Kids Academia Science Program
－Enriching Exceptional Needs and Characteristics of Gifted Young Children in Japan－

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Abstract

Providing appropriate educational programs for gifted children is a challenge for educators. This paper aims to analyze a science program of the Kids Academia, developed for gifted children in Japan. The study focuses on the questions: (1) What set of criteria was used for identifying and selecting gifted children for the program? (2) How were the science themes and topics selected for gifted children? (3) What type of science activities were provided for the gifted children? In answering these questions, participant-observation method was used: the participants' selection process was examined, the science lesson plans were analyzed, and other important documents were examined. The result of the study shows that the special science program of Kids Academia is successful in designing a program that will respond to the needs and interests of gifted Japanese children.

Keywords: gifted young children, science program, Kids Academia, Japan

Introduction

In general, gifted children are born with abilities that are different from the children of their age (Silverman, 1992). They are fast learners, curious, keen observers, problem and solution finders, and possess sharp memory. It is quite a challenge for educator to respond to the diverse characteristics and needs of gifted children (Braggett, 1997; Hovis, 2004). Often these children are offered with a curriculum that is less challenging and stimulating, which can cause them to become unmotivated and pursue non-excellence (Cheng, 2008). Hence educators need to do more to help these children maintain their motivation to learn and to avoid wasting their skills and talents (Smutny, 2004). One way that this can be done is by offering an appropriate program that is specially designed according to their needs and characteristics.

The purpose of this study is to analyze the Kids Academia Programme for gifted young children in Japan. Kids Academia is an innovative program to address the needs of gifted young children in the field of science in Japan. The analysis focuses on the processes of selecting the children who participated in the program, the process of selecting the contents and themes, and designing learning activities. The results of the evaluation are very useful in identifying good practices for addressing the educational needs of

gifted young children.

Responding to the Needs of Gifted Children

Students who are gifted do more than just absorb knowledge. They have the ability to see the big picture, as evidence of their ability to deal with a variety of concepts at any time and organize them into large, meaningful patterns. They have intellectual curiosity that fires a need for mental stimulation and an intuitive sense of appropriateness reflected in a good judgment (Clark, 1997).

Providing and addressing the needs of gifted children is the primary concern of many educators of gifted children. However, the attempt has not succeeded because of the lack of enough attention given to gifted population (Tannenbaum, 1983). Program for the gifted should give students the opportunities to reach their full potentials and talents.

Passow (1988 as cited by Berger, 1991) recommended that education for gifted learner should accomplish these goals: 1) include more detailed, complex and in-depth study of major ideas, problems, and themes; 2) allow for the development and application of productive thinking that enable the students to use prior knowledge to create new knowledge or idea; 3) permit students to explore constantly changing knowledge and information and to develop the attitude that knowledge is worth pursuing in an open world, 4) promote exposure to, selection of, and use of appropriate resources; 5) encourage self-initiated and self-directed learning growth; 6) provide the development of self-understanding and the understanding of one's relationship to persons, social institutions, nature and culture; and 7) evaluate students with focus placed on their ability to perform at a level of excellence that demonstrates creativity and higher-level thinking skills.

Gifted children also have the right to have appropriate gifted program. They need a program that would enhance their unique abilities and would address their natural curiosity and intellectual capacities (Parke, 1989). Hence, educators should acknowledge the needs of gifted children as they acknowledge those of non-gifted children (Winnerbrenner, 2002).

Element of a Good Science Program for the Gifted

Among subjects in school, science is the most intriguing for gifted children (Van Tassel-Baska, 1998). Through this subject, children can learn important science skills such as observing, data gathering, analyzing, and problem solving skills. With this, it is necessary to ensure that gifted children are provided with an appropriate science program.

Berger (1991) suggests eight major components of an effective program for gifted students. These components are also important for developing a good science program for gifted learners. These are: (1) *needs assessment* – this component enables teachers to gather information about the nature and the instruction need of the students; (2) *definition of the population* – a clear definition of the population will serve as the foundation of the program. The definition should be based on the results of needs assessment. It will help teachers to think of the appropriate strategies to address the kind of learners that (s)he have; (3) *identification procedures* – this component allows teachers to identify the differences and needs of the students, the students who need interventions and those who need more challenges; (4) *program goal* – the goal of the program should be clearly stated and respond to the target population. It should state the expected students' outcomes that are identified in the needs assessment; (5) *program organization and format* – this refers to the decision on how students will be grouped for instruction, where

instruction will take place, how often instruction will occur, who will provide instruction, and who will be responsible for the program and the administrative organization; (6) *staff selection and training* – this is where the success of the program for gifted children lies on. The members of the program should have the eagerness, interest, and heart for the program; (7) *curriculum development* – the most successful curriculum has a well organized scope and sequence and is based on the characteristics and needs of the target population; and (8) *program evaluation* – it is the most critical component because this will decide on the effectiveness and success of the program. The results of the evaluation help educators to do revision or correction of the existing curriculum.

It is necessary that the science program for gifted children effectively promote learning. The Center for Gifted Education of The College of William and Mary listed the following elements that a good science program should have emphasis on the following (Van Tassel-Baska, 1998):

(1) *learning concepts* – the teaching of science for the gifted must focus on the important concept. It is important that children know how scientists work for them to learn and understand the fundamental ideas that are used in the science world. Concept such as change, system, reductionism and scale plays a major role for learning core ideas in science. The core ideas do not change, but the applications do.

(2) *higher-level of thinking* – students need to learn important science concepts and use those concepts to in complex ways. Having students to analyze relationship between the real world problems, allows them to see the connection between the science and society. This situation leads them to use critical and creative thinking in a problem-based experience.

(3) *inquiry, especially problem-based learning* – students who can construct understanding about science know the appropriate scientific skills that can be applied in the situation that they can encounter. Through guided questions by the teacher, dialogue and discussion with other students, and self exploration of key questions, student can develop the valuable habits of mind found among scientists such as skepticism, objectivity, and curiosity.

(4) *the use of technology as a learning tool* – through the use of technology students and teachers can easily connect to the real world of opportunities. Teacher can have access with different innovations and strategies in teaching and make a fool of scientific researches that they can use in the future. Also, teachers can help children connect to people that can help in their research through e-mail.

(5) *learning the scientific process, using experimental design procedures* – through experiment students can apply the scientific skills that they have learned. One of the realities we have uncovered is how little students know about experimental design and its related processes. Ready-made experiments often teach students to follow steps to a preordained conclusion. It is important that students have the opportunity to design their own experiments. Original work in science allow them to read and discuss a particular topic of interest, come up with a problem to be tested, find appropriate steps to solve the problem, further discussion, reanalysis of the problem and share their finding to a relevant audience.

Developing an appropriate science program for gifted students can be achieved through careful planning. Including these elements in a program for gifted children can help educators to develop an appropriate science program.

Kids Academia Program

Elementary education is a compulsory in Japan and is supervised by the Ministry of Education

Science Sports and Culture. The course of study and policies also comes from the ministry. Among the subjects that are included in the elementary curriculum is science. In grades 1 and 2, science is integrated to social studies under the program called *Life Environmental Studies* wherein it utilizes experiments and observations to help students gain insights into natural phenomena (Monbusho, 1994, as cited by Mayer, 1996). Formal teaching of science starts from grades 3 to 6.

The primary goals of elementary science education are: to develop the ability at solving problems, to foster love and sensitivity towards nature as well as the understanding of natural things and phenomena by utilizing a variety of observations and experiments, thereby fostering scientific view and thinking. In order to achieve these goal children should be provided with different activities that can help them develop scientific skills and love for nature.

In Japan, the growing awareness of giftedness revealed through the establishment of Super Science High School in 2002. This program offers special science curriculum for high school students with exceptional abilities and skills. However at present, there is no formal educational system for gifted students in the country.

Kids Academia is a program for Japanese gifted young children ages 5 -8 years old. The children are from kindergarten to grade 2. This program offers a science curriculum tailored to the characteristics and needs of the children. The theme, content, and process of the curriculum include enrichment, extension and acceleration activities to suit to the characteristics of gifted children. The science curriculum offered to gifted young children may serve as early foundation to develop scientific and social skills.

One of aims of the program is to create a science curriculum with original science activities that will help children to develop science and social skills through different science activities. The unique features of program are the design of the curriculum, the teaching approach, the use of scientific apparatus, and the use of modified scientific wheel as guide for developing children scientific skills. The curriculum is divided into two interesting themes. Each theme is composed of 3 different science topics.

Methodology

The purpose of this study is to describe and analyze a science program for gifted young children in Japan. Specifically, this will answer the following questions: (1) What are the criteria for identifying and selecting gifted children who participated in the program?; (2) How the science themes and topics were selected for gifted children?; and (3) What type of science activities are provided for the gifted children?

This study used documents and curriculum and lesson plan analyses as main tool for gathering data. In order to answer the questions, this study used three phases. Phase one focused on the analysis of participant's selection process. This phase was done to know the process of selecting the children that will participate in the program. This process was done to identify the characteristics of children and the reasons for joining the program. Phase two engaged on analysis of documents. In this phase the researcher analyzed how themes and topics were selected. Phase three involved the analysis of the lesson plans used in the program. This phase analyzed the type of science activities that teachers included in their lesson plan.

The program was conducted at Faculty of Education, Ehime University. This faculty is known for many researches about development of science education.

Participants

The study was participated by 10 selected gifted young children ages 5 – 8 years old. The group was composed of five boys and five girls from kindergarten to grade 2. The students who participated in the

program are all studying at the laboratory school of the university. On the other hand, the facilitators were composed of one head teacher, two curriculum advisers and 6 teaching assistants. They served as the curriculum and lesson plan developers.

Table 1. Number of students who participated in the program

Gender	Grade Level		
	Kindergarten	Grade 1	Grade 2
Male	0	4	1
Female	1	2	2

Results of the Study

1. What are the criteria for identifying and selecting gifted children who participated in the program?

First phase was the selection of the children who will participate in the program. Forty nine children from kindergarten to grade 2 showed interest in the program. The application form was divided into several parts. First part focused on the profile of the child. To better know the characteristics of each child, a checklist was used. Items in the checklist were adopted from the *Gifted Behaviour Checklist in Science for Primary Children* (Sumida, 2010). The checklist focused on the following: a) *knowledge*, for example if the child is knowledgeable with specific science topic; b) *interests*, which focuses on the child's persistence in exploring specific task and trying to do things in his/her own ways; c) *thinking*, which involves the child's ability to come up with own ideas and answers about a question, and *skills* which centers on the child's ability to express findings in his/her own words. Children were rated using the scale as follows: 1, never observed; 2, seldom observed; 3, sometimes observed; and 4, frequently observed. Some items were modified to suit to the characteristics of kindergarten children.

The second part of the application form was meant to ask children of their reasons and intensions of joining the program. Parents were also asked to state their reasons and expectations in the program. The information gathered helped the teachers to develop a curriculum based on children and parents' expectations. Last part probed on parents' willingness to support their children and the program. The program recognized the importance of participation and role of parents in making the program successful. After analyzing all the application forms, only 10 out of 49 children-applicants were selected.

The application form used for this program is a good tool for identifying and learning needs and characteristics of gifted children. The information given by the parents and children provides essential information for program developers. The information gathered from the form will help curriculum developers to plan appropriate, challenging, interesting, original and meaningful activities that cater the characteristics of gift young children.

2. How the science themes and topics were selected for gifted children?

Developing a curriculum for gifted children involves careful selection of themes, contents and learning experiences. The curriculum should be interesting, intriguing, appropriate, challenging, and develop skills that are essential for gifted children to learn. Curriculum planning is not a meager repetition of steps to achieve the goal of addressing the delicate needs of gifted children.

One of the crucial parts of the program was the selection of themes and topics to be taught. The curriculum developers underwent several stages in deciding the themes and topics to be used in the program.

(A) Group Meeting and brainstorming activities. The teachers and the teaching assistants held several meeting and brainstorming activities to decide on the themes and topics to be included in the program. The head teacher presented a list of topics during the brainstorming activity. The topics were

human body, animals, plants, matter, energy, water, electricity and Earth. After several meetings and brainstorming activities, the group decided on two themes: water and human body. These themes were selected out of the consensus reached by the teaching assistants and the approval of the head teacher.

Each theme aimed to help children: a) know and understand the parts, functions and needs of their body for them to use it properly and productively; and b) understand the essential benefits that they can get from water and the persisting call to keep water clean.

The topics, “Water” and “Human Body” are also included in Japan elementary science course of study. Teaching these topics start from grade 3. The study of water with regard to its properties is taught in grade 3. Topic on how running water transforms land, and water and the various changes that take place in the natural world are included in grade 4 lesson. The various ways of dissolving substances in water depending upon temperature and amount of water is part of grade 5 lesson. Lastly, the function of water to living things and environment and the properties of water solutions are included in grade-6 science curriculum.

The structure of the human body is taught to grade 3 children learn. The inter-relationship of human to the environment is taught in grade 4. In grade 5 the process on how human being grows is included. The study of different body system and the characteristics of human beings and their interaction with the environment are taught.

(B) Selection of content for each theme. The themes that have been selected were divided into three lessons. The theme water included lessons such as: 1) phases of water, example turning ice to water, water to ice and water to gas; 2) objects that can and cannot be dissolved in water; and 3) water cycle. On the other hand, the study of: 1) growth and development; 2) five senses; and 3) heart and heartbeat are included in the theme human body.

Groups of teaching assistant were assigned to

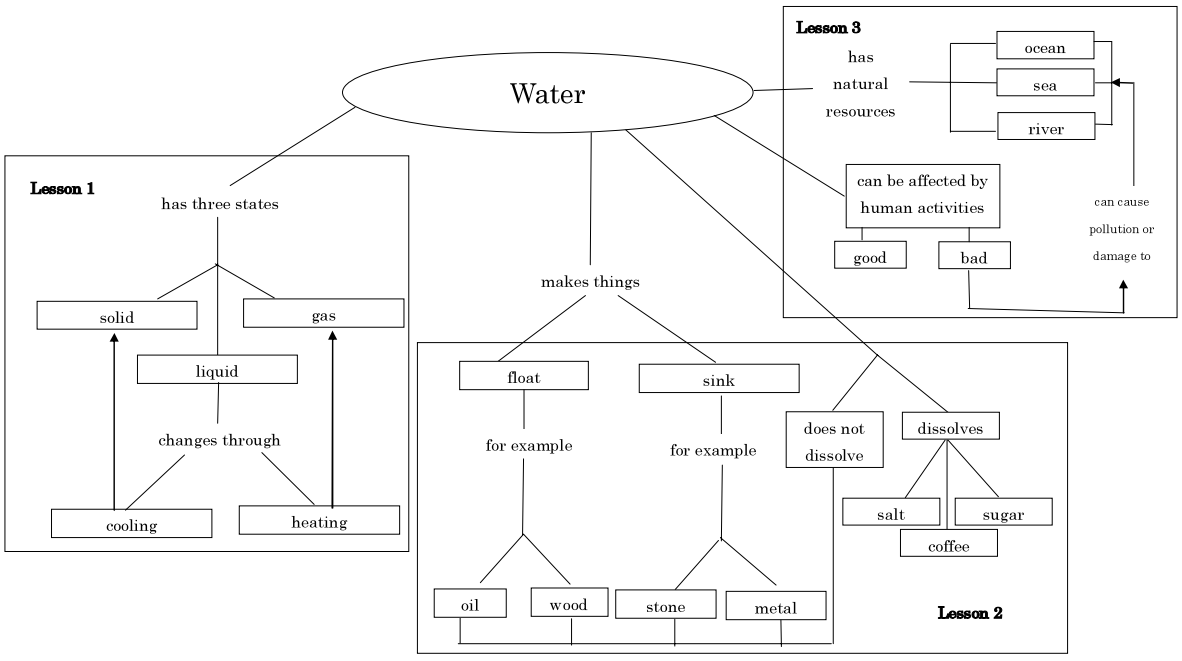

Figure 1. The Concept Map on the theme "Water"

carefully choose contents to be included in the curriculum. The following are the points that they considered in choosing contents: 1) interesting to the children; 2) originality; 3) practicality; and 4) connection in everyday life. Concept mapping was used to organize and to arrange contents. It will prevent the overlapping of contents and see the connection of contents to each other. Connection among topics is an important consideration in organizing the content because it will help children to see the big picture of the theme and relationship of the content to other contents. For gifted children, it is important that lessons are interconnected to each other. The interconnection of the content can help gifted children to use *a priori* to present information. Further, this will help gifted children highly appreciate the content.

Figure 1 shows a concept map on how teachers arranged, organized and connected the content of the topic about water.

(C) Designing the Lesson. Teaching assistants were asked to prepare lesson plans based on the theme and content that they have chosen. In preparing the lesson for the program these steps were executed:

1. *Formulating clear objectives* – includes what teachers want their students to accomplish after the lesson. The objective focuses on the development of scientific and social skills of gifted children.
2. *Outlining the Lesson* – shows the interrelationship of the core scientific understanding to the enrichment, extension, and acceleration activities.
3. *Allotting Time* – serves as basis for the time that should be allotted for every activity.
4. *Choosing the appropriate materials and resources to be used for the lesson* – teaching assistant chooses the materials that they need in each experiment. Some of the considerations in choosing materials are easy to find and cheap.
5. *Developing the flow of the lessons* – contains the procedures of the activities and experiments that teaching assistant prepared. For the program there are at least 3 experiments for every topic that is connect to everyday lives of children. To make sure of the smooth flow of the lesson several trials and mock presentations are done.
6. *Including new scientific words* – provides a list of new scientific words used in the lesson is provided for the children. This is to familiarize children with different words used in science.
7. *Providing activities at home* – allows children to have further study about the topics they have learned.
8. *Providing a list of books, articles, and web addresses that children can read and visit* – contains a list of supplementary materials is provided for children for further reading and understanding of lesson learned.

3. What types of science activities are provided for the gifted children?

The innate characteristics and curiosity of gifted children can be address by providing intriguing and challenging science activities. One of the unique features of the science curriculum offered in the program was the inclusion of enriched, extended and accelerated activities in designing the theme, content and product. The inclusion of these elements helps teachers to plan activities appropriate to the characteristics of gifted young children.

The activities in the program were carefully planned and prepared by the teachers and assistant teachers. In selecting the activities, these guidelines were used: (1) stimulates interest of the children; (2) allows children to express their own ideas and findings; (3) uses cheap and easy to find materials; (4) teaches the correct use of scientific terms; (4) use simple laboratory equipment such as ruler and

weighing scale; (5) allow individual, pair or group activities; (6) should encourage socio-emotional development; (7) connected to other subjects and everyday life; (8) include theme or topics about family and community; (9) use materials connected to family and society; and (10) apply what children have learned to their family and society.

In addition, the "*Wheel of Scientific Investigation and Reasoning*" was developed for the Kids Academia Program on the basis of the scientific wheel model at the Center for Gifted Education of the College of William and Mary, and used as guide in developing scientific skills of gifted children. The William & Mary model is divided into 6 areas which composed of: 1) making observation; 2) asking questions; 3) learning more; 4) designing and conducting the experiments; 5) creating meaning; and 6) telling others what was found. However, the Kids Academia Model was divided into 7 areas. The designing and conducting the experiment part were separated from two. Designing the experiment focuses on identifying the method to be used in the experiment while conducting focuses on the application of the method formulated. This wheel can help teachers to develop lesson plans that focus on particular skills.

The head teacher approved carefully planned lesson plans developed by the teaching assistants. Upon approval, several try-outs of the lessons were done to ensure smooth implementation of activities and experiments, and to identify parts of the lesson that needed improvement.

As mention above, each theme was composed of several lessons. For example, the core scientific concept of Lesson 3 focused on water cycle. It included enrichment activities that allowed children to understand the flow of water and how water gets to the sky. Extension activity focused on causes of water pollution. The lesson also included activities that allow children to think of possible ways of preventing water pollution. Finally, children were taught of filtering river water, and how to make improvised water filter using easy to find materials such as sand, pebbles, rocks, plastic bottle, filter paper and rubber band. Further, children were provided with activities that they could perform at home. This allowed children to ponder extensively on the topic.

Throughout the implementation of the lesson, children exhibited active participation. Constant provision of open-ended questions engaged children to think. Children were made to realize the connection of a lesson to other contents. Interaction with peers, through group activities, allowed them to learn how to work with others.

In addition, all activities made use of worksheets that allowed children to record data and information they gathered be it at school or at home. These activities offered children opportunity to gain other relevant information other than simple science contents and concepts. For example, for the activity on filtering and comparing different substances at home, one child remarked that some substance needs more time and hard to filter.

As part of the program, a culminating activity was also held. Children were asked to make individual experiments. Using the scientific skills that they have learned, they conducted original experiments. During the culminating activity a child presented his experiment about body measurement. The child pointed out that the measurement of our forearm is the same as our feet. Another child presented his experiment on the amount of salt that seawater can produce. One student made an interesting presentation on changing the color of the flower by soaking it to colored water. Children presented and reported their finding in front of the teachers, visitors, parents, and other children as part of their culminating activity. In addition, curriculum advisers gave comments to the children after presenting their experiments.

Insights Gained from the Program

The following are the insights that the researcher gained from Kids Academia Programme:

1. In developing a program for the gifted it is important to consider: 1) the characteristic, interest and interest of children; 2) children's and parents' expectations; and 3) parents' support. The checklist used in the program that focuses on the knowledge, interest, thinking and skills is a useful tool for identifying the characteristics of children. The information provided by the children and parents helps program developers to design lessons that are based on children's interests and needs, and parents' expectations. Parents' willingness to support the program is a factor to be included in the selection process because role of parents is an invaluable contribution to the success of the program.
2. Deciding on the themes and contents to be included in the program was a complicated and a challenging task. In selecting the themes and contents for gifted children the following should be considered: 1) spurs interest; 2) relevant to the curriculum; 3) connected to everyday life; and 4) interconnectedness of themes and contents. These elements can help program developers to decide on the themes and contents to be taught for gifted children.
3. Choosing the types of activities for the gifted children should be meticulously done. In choosing the activities program developers should consider the following: the activities should be encouraging, allow inquiry and problem solving, focus on developing higher-order thinking skills, use easy to find science equipment, especially for those countries that do not have state-of-the-art science equipment, and help children learn scientific process. The wheel of scientific thinking and reasoning used in this study can be a helpful guide for developing scientific thinking skills of gifted children.
4. In planning effective lessons for gifted children, program planner should: 1) have clear objectives that focus on developing higher-order thinking skills; 2) include enrichment, extension, and acceleration activities that modify the core theme, content, and product; 3) consider the time and the materials to be used for the activities; 4) provide hands-on, interesting, practical and challenging experiment and activities for gifted children; 5) develop skills related to data gathering, creative, critical thinking, and problem-solving; 6) give children opportunities to report and share their findings; 7) assign activities that children can do at home for further study; 8) provide list of new scientific words that children can learn; and 9) provide list of books that children can read for further understanding of lesson learned. These elements can be used as guide for planning science lessons for gifted children.
5. Gifted children should be taught how to work together and deal with other people. Program for gifted children often focuses solely on developing thinking skills and, thus, implicitly placing social skills underrated. Kids Academia program provides a balance between the development of thinking and social skills for gifted children. The pair and group activities provided for the gifted children help them develop social skills. In these activities, gifted children can share ideas with other children. They learn to think together with other children in finding solutions for a particular problem. They put their minds on together while they socialize.
6. The demanding characteristics of gifted children require teachers with exceptional characteristics. Teachers of gifted children should possess: high degree of intelligence, expertise in science, self-directedness in own learning and has love for

learning, emotionally stable, genuine love for gifted children, respect for individual differences, and highly developed teaching skills and knowledge.

7. Evaluation tools such as worksheet, notebook and research presentation are good tools for evaluating gifted children's progress. The program uses these tools to evaluate and assess children. Children's abilities to gather data, develop hypothesis, and consider important information can be seen through the use of worksheets and notebook. Further, the development of scientific thinking skill, reporting and sharing information can be evaluated during the presentation of their individual experiments.

Conclusion

Indeed exceptional abilities of gifted children can be addressed through an appropriate and responsive program. Kids Academia Programme is an example of an excellent program for gifted young children in Japan. The program is deemed successful in developing a program that is responsive and challenging for children. The success of the program lies on the provision of a science curriculum that enhance the theme, content, and product by including enriched, extended and accelerated activities.

The initiative in providing science program for young gifted children can be a venue to strengthen the field of gifted education in country. Further, the design of the program is a good model that can be followed by educators who are planning to develop science program for young gifted children, regardless of cultural differences.

References:

Bainbridge, C. (2008). *What to look for in a good gifted program: criteria to use for evaluating a school for your gifted child*. Retrieved on February 11, 2011 from http://giftedkids.about.com/od/educationoptions/a/criteria.htm

Berger, S. L. (1991). *Developing Programs for Students of High Ability*. Retrieved on February 9, 2011 from http://www.ericdigests.org/pre-9220/high.htm.

Braggett, E. (1997). *Differentiated Programs for Primary Schools: Units of Work for Gifted and Talented Students*. Australia: Hawker Brownlow Eduaction.

Cheng, G. (2008). *Gifted Children in Public School*. Retrived on February 7, 2011 from http://www.publicschoolreview.com/articles/34.

Clark, B. (1997). *Growing Up Gifted: Developing the Potential of Children at Home and at School (5th ed.)*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Conklin, W. & Frei, S. (2007). *Differentiating the Curriculum for the Gifted Learners*. Shell Education, USA: California.

Fertig, C. (2006). *What are the characteristics of effective teachers of the gifted?* Retrieved on February 28, 2011 from http://resources.prufrock.com/GiftedChildInformationBlog/tabid/57/articleType/ArticleView/articleId/115/Default.aspx.

Hovis, S. (2004). *Differentiated Curriculum for Classroom with Gifted Children*. Retrieved on 11 June 2010 at http://www.newhorizons.org/strategies/differentiated/hovis.htm

Mayer, V. J. (1996). Development in Japanese Science Curriculum. Retrieved January 28, 2011 from http://earthsys.ag.ohio-state.edu/MayerHP/curriculum.htm

Parke, J. P. (1989). *Instructional Strategies for Teaching the Gifted*. NH, Massachusetts: Allyn and Bacon.

Roedelle, W. (1990). *Nurturing Giftedness in Young Children*. Retrieved on February 28, 2011 from http://www.ericdigests.org/pre-9216/young.htm.

Silverman, L.K. (1992). *How Parents can Support Gifted Children*. Retrieved on February 7, 2010 from http://www.hoagiesgifted.org/eric/e515.html.

Smutny,J.F. (2004). *Teaching Young Gifted Children*

in the Regular Classroom. Retrieved on November 20, 2010 from http://www.education.com/reference/article/Ref_Teaching_Gifted/.

Sumida, M. (2010). Identifying Twice-Exceptional Children and Three Gifted Styles in the Japanese Primary Science Classroom. *International Journal of Science Education*. 32(15), 2097-2111.

Tannenbaum, A. J. (1983). *Gifted children: Psychological and educational perspectives*. New York: Macmillan.

Van Tassel-Baska,J. (1998). *Planning Science Programs for High Ability Learners*. Retrieved on March 12, 2010 from http://www.kidsource.com/education/science.gifted.html#credits

Winebrenner, S. (2002). *Teaching Gifted Kids in the Regular Classroom: Strategies and techniques Every Teacher can Use to meet the Academic Needs of the Gifted and Talented*. Minneapolis: Free Spirit Publishing, Inc.