

# ***Gifted Development Center***

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## **The Visual-Spatial Learner**

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### **Introduction**

In our research with gifted children at the Gifted Child Development Center over the past 10 years, we have observed that a substantial portion of our sample of 1,300 students exhibit extraordinary visual-spatial abilities. They perform well beyond age level on puzzles, mazes, block design, block counting (counting three-dimensional arrays with hidden blocks), and similar tasks. This subgroup includes most of the highly gifted children we have assessed, those with IQ's in excess of 150, as well as the majority of underachievers brought to our center. The major differences we have found between highly gifted and underachieving children have been in their responses to auditory sequential tasks such as repeating digits, repeating sentences, and telling the days of the week in order. Highly gifted students appear to have unusual facility with both types of items, whereas underachievers appear to be high on visual-spatial tasks and low on auditory sequential items.

Through analysis of performance on specific test items, behavior during testing, anecdotal records from teachers and parents, and information obtained through interviews with parents, we have amassed data on dominant learning modes, behavior patterns, and personality characteristics that appear to be correlated with high visual-spatial abilities. We have found clusters of traits appearing with such regularity that we have come to believe that they are directly related to a visual-spatial orientation to learning. Interviews with adults suggest the existence of other constellations of spatial abilities less related to the visual domain, but this paper is specifically concerned with the patterns we have observed in our assessments of gifted children, in whom spatial abilities and visual abilities appear to be highly correlated.

### **Background**

The past decade has given rise to a considerable amount of research on left-brained and right-brained abilities and learning styles. The left hemisphere is thought to be responsible for temporal, sequential, and analytic functions, whereas the right hemisphere is considered to be the origin of spatial, holistic, and synthetic functions (Bogen, 1969; Dixon, 1983; Levy-Agresti & Sperry, 1968). Although the specific location of these functions has been questioned, their existence is a matter of record and has been independently demonstrated in numerous fields, such as different branches of psychology and neurophysiology (Das, Kireby,

& Jarman, 1979; Kinsbourne, 1980; Luria, 1966, 1971). Most researchers agree that integration of both hemispheres is necessary for higher level thought processes (Levy, 1974, 1982). We all use both hemispheres but not with equal facility. Some individuals show a high level of integration of sequential and spatial functions, but most seem to naturally favor one or the other mode of learning.

Spatial and sequential dominance are two different mental organizations that affect perceptions and apparently lead to different world views. Information deemed central to one world view appears irrelevant from the other perspective. The sequential processor is profoundly influenced by time and is less aware of space; the spatial processor is preoccupied with space at the expense of time. These diverse ways of relating to the world have had powerful ramifications throughout history in the development of various philosophies, religions, cultures, branches of science, and psychological theories.

Western and Eastern philosophies and cultures provide dramatic examples of these differences. Western thought is sequential, temporal, analytic; Eastern thought is spatial and holistic (Bolen, 1979). Western languages are constructed out of nonmeaningful elements - letters of the alphabet; Eastern languages have been composed of pictorial representations. Western children excel in verbal, analytical abilities; Eastern children excel in visual-spatial talent. One perceptual framework is not better than the other: in fact, they are complementary - the yin and yang of the universe.

These diverse mental organizations appear to be innate. Although one can gain more facility with one or the other mode through learning, it is unlikely that a person with sequential dominance can learn to perceive the world in exactly the same way as an individual with spatial dominance or vice versa. Instead of trying to remake one or the other style of learning, we need to accept these inherent differences in perception and appreciate their complementarity. We inhabit a spatial-temporal reality, and those with greater facility with time can lead us to a better understanding of that dimension, whereas those with a better understanding of space can provide us with a clearer picture of that dimension. When these differences are not understood, there is dissension: when they are honored, they enable an exchange of information that forms a more complete conception of reality than can be gained by either perspective in isolation.

### **Characteristics**

Visual-spatial learners perceive the interrelatedness of the parts of any situation. Their learning is holistic and occurs in an all-or-none fashion. They are most likely to experience the "Aha!" phenomenon, when all of the sudden they "get it." This type of learning does not take place through a series of steps, and if these people are asked to retrace their steps in the learning process, they usually cannot. From the time they can talk, children of this orientation arrive at surprising conclusions. When they are asked how they got there they often shrug

their shoulders and say they don't know. They may create visual models of reality that are two dimensional, three dimensional, or even more multifaceted.

As toddlers, these children like to see how things work, and they tend to pull apart everything they can get their hands on. To the surprise of their parents, sometimes they even put the things back together again correctly. But as often as not, they enjoy restructuring the elements into something new. Some of these children never see anything as it is but only as a conglomeration of parts that were meant to be reconstructed into something else. Their parents remark about their amazing imaginations.

Imagination is a key element in the mental processing of visual-spatial learners. As preschoolers, they may have several imaginary playmates and a rich fantasy life. If they are introverted (which many of them are), they will rehearse everything mentally before they attempt it: walking, talking, reading, riding a bicycle, etc. Some of these children never learn to walk one step at a time like most children: they just start out running. Some begin talking much later than others, but their first "word" is a 14-word sentence. One girl watched others riding their bicycles and practiced mentally until she knew how to balance herself, then got on the bike, and rode without difficulty.

These children are unusually fascinated with puzzles and mazes and have expert facility with them. They will spend endless hours building with construction toys (blocks, Lego sets, Tinker Toys) or other materials (sand, sticks, cardboard boxes), and their constructions are often quite sophisticated and intricate in design. If they are interrupted, they will probably become "deaf," and if their buildings are destroyed, they become enraged. They get very attached to their creations. When given an ordinary toy, they will play with it long enough to figure out how it works and most likely never touch it again. They enjoy novelty and challenge.

Spatial abilities underlie both mathematical talent and creativity. A spatial child may manifest one or both of these talents. Given the opportunity, these children often begin quite young to have a lifelong love affair with numbers and numerical relations. Creativity may be evidenced in artistic talent, inventiveness, or imagination applied to any field. Despite these strengths, visual-spatial children often have a great deal of difficulty with school and social relations. They may do fine until they reach school or preschool and have to fit into time schedules, routines, and other children's games. They are likely to be elaborate doodlers, movie buffs, or computer fanatics, while regularly forgetting their homework.

**Frequently observed strengths and potential weaknesses of visual-spatial learners are listed in Table 1.**

Most of the strengths listed are observed in the entire group of visual-spatial learners, including the majority of highly gifted children in our sample. The potential weaknesses are found only in a subset of this group: the underachievers. These are the children who appear to be gifted to their parents but not to their teachers (Silverman, Chitwood, & Waters, 1986). They suffer from a form of "6-hour retardation" that often disappears when they are placed in

gifted programs. Their learning style is best suited to the instructional techniques, pace, and complexity characteristic of classes for the gifted. Yet they are the least likely to be placed in gifted programs because they do not get teacher recommendations. When achievement in the rote learning of sequential material is used as the basis for selecting children for gifted programs, these children lose out. Those in most danger of being overlooked are the introverted visual-spatial learners.

### **Introversion**

We have noted an interesting linkage among IQ, visual-spatial abilities, and introversion, measured using a scale we have developed (Silverman, 1986). The higher the child's IQ, the more likely are both visual-spatial abilities and introversion to be present. At this point we are uncertain as to the nature of the relationship between introversion and visual-spatial processing, but we can see several common characteristics of introverts and spatial learners. Children in both groups are reflective, needing extra thinking time before entering into tasks; both groups need time to observe others; both groups have some difficulty with risk taking. There are other parallels, but it is also possible to be one type and not the other.

Introverts start school by screaming for Mommy not to leave them. Then they stand on the periphery and watch the others, without talking to or interacting with anyone (Keirsey & Bates, 1978). When they finally muster up enough courage to enter into the other children's activities, they try to redesign everything to fit their own vision of the way things should be. When the extroverts do this, they often become leaders: they have a charming way of getting everyone to do things their way. But the introverts are not as fortunate: they are seen either as "bossy" or "weird" and are rejected by the others. since they tend to be supersensitive, they may withdraw into their own worlds after this type of rejection.

Introverts gain their energy from themselves and find people very draining. After long periods of time with people, they need time alone in order to regroup. They are very private and are often perfectionistic. If one of their mistakes is made public, they become intensely humiliated. They prefer to go through their growing pains in private and show the world their finished products (Keirsey & Bates, 1978; Myers, 1962). This is why they mentally rehearse so many of their activities before actually attempting them. They often have tremendous difficulty with risk taking, and so teachers tend to think of them as "uncreative." However, many introverts are highly creative in private, just not in public.

Like the visual-spatial orientation, introversion is an inborn characteristic that remains fairly stable throughout life (Myers, 1962). Some introverts may appear very outgoing to others in their adult lives, but this appearance is like a Sunday set of clothes that they don around others. Basically, they retain their need for privacy and are known only by a very few trusted friends throughout their lives. Unfortunately, since the greater part of our society is extroverted, introverts are not well understood, and well-meaning parents and teachers often try to remake these children into extroverts, unwittingly damaging their self-esteem. Like any

other minority group, these children may learn the language and behavior of the majority, while feeling different from, and possibly inferior to, others. Again, as with the visual-spatial style, introversion must be respected by others in order for these children to learn to respect these qualities in themselves.

### **School Performance**

The spatial style of learning is not well suited to school tasks. The school curriculum is sequential; the textbooks are sequential; the workbooks are sequential; the teaching methods are sequential; and most of the teachers are sequential. Time is important in school - being on time, turning in work on time, finishing activities in a timely fashion, and moving on to new activities in a set schedule. Rote memorization, drill, and practice are all designed for the incremental learning style of the sequential learner. All of this seems quite foreign to spatial children, and they often retreat into their own worlds. Teachers perceive them as "spacy," inattentive, or uncooperative. They are often late for school, behind in their work, or reluctant to move on from one activity to another. They usually feel out-of-step with the other children and with the expectations of their teachers.

These children despise routine, repetitive tasks. They do not learn by means of rote memorization. In order for them to learn, they must see how the parts are related to the whole. If the learning is doled out in small increments, they don't understand what is going on. They may ask a great number of questions because they can't grasp the meaning of an isolated fact or activity until they have grasped the whole structure. Once they understand the basic concept, the learning is relatively permanent, and they are ready to go on to something new. They balk at drill and practice because such exercises do not enhance their understanding.

For example, if division is taught by means of a series of steps, spatial learners may not catch on at first, but once they understand the procedure, they may not see the point of doing a series of practice problems. They may refuse to do the work or do it sloppily so they can go on to something more interesting. If they make computational errors, it does not seem important to them because they are more concerned with understanding the conceptual structure.

One area in which spatial abilities and introversion interact is risk taking. Spatial learners are often reluctant to take risks until they have all of the pieces of information in hand and see how they fit together. Sequential learners can devise step-by-step strategies to approach new tasks or skills, but spatial learners cannot make such plans. In their all-or-nothing learning style, they have either discrete bits of information that do not add up to anything or a complete understanding of the entire system. When they only have pieces, they become afraid because they do not know how to weave them into the patterns needed for understanding. Then, suddenly and without warning, the pieces come together and weave their own pattern. The children are never quite sure whether this will happen, when it will happen, or how it happens, so they have to rely on faith alone that the pattern will form itself if they are just

patient. This way of learning does not instill confidence in their ability to handle new situations, and it often leads to low evaluations by their teachers; researchers have found that teachers tend to underestimate the abilities of children who hold back in new situations (Chess, 1968; Gordon & Thomas, 1967; Thomas & Chess, 1977).

### **Behavior Problems of Nonsequential Learners**

One type of spatial child may present behavior problems. This is the child who not only has spatial strengths but also several sequential weaknesses. Spatial dominance does not automatically imply sequential weakness; rather, it means that the children tend to lead with their dominant spatial abilities first and to use their sequential abilities only if all else fails. But some children have few sequential abilities to use as a backup system. These children tend to be more volatile because their reactions are not mediated by a clear understanding of consequences.

Sequential children are able to plan ahead, delay gratification, and inhibit aggression because they can organize step-by-step strategies for getting their needs met. When they become angry, instead of reacting, they can think ahead in time and predict what would happen if they retaliated aggressively. They learn to stop and think, come up with alternative plans of action, and implement their plans. All of this requires sequencing ability.

By comparison, a spatial child with sequential deficits lives in the moment and does not take the future into consideration. He may lack the ability to see the consequences of his behavior. When angered, he may not be able to mediate his behavior by means of planning an alternate sequence of events. He may simply react. At that moment, all he understands in his anger, and he becomes that anger.

Many of these children can be helped to bring their behavior under control through a combination of counseling and placement in small classes with individualized instruction. An individualized program reduces the amount of frustration with which the child has to cope. Another useful technique is computer-assisted instruction. The computer is a natural tool for a spatial learner, and temper tantrums rarely occur when the child interacts with a computer instead of people.

In terms of discipline, both at home and at school, spatial children respond much better if they understand reasons for the behavior requested of them. They will also be more cooperative if they have some input into the decision-making process and some legitimate choices. Discipline must be private, as these children are highly sensitive and easily humiliated. If they are respected, they will learn to treat others with respect.

### **Recommendations**

Visual-spatial learners need a gestalt approach to learning. They do best when they deal with whole systems, abstract relationships, major concepts, inductive learning, and problem

solving. They excel when provided with manipulatives, visual representations, models and computers. Teachers may be able to relate to their learning style if they ask themselves, "How would I teach this concept to a deaf child?"

Many times these children will miss easy concepts but will achieve at a high level with much more difficult material (Baum, 1984; Schiff, Kaufman, & Kaufman, 1981). They should not be forced to succeed at the easier material before they are allowed to explore more advanced concepts. Even though it may seem that the difficult concepts are "built" on the easier ones, the spatial learner often grasps simple concepts only in the context of more complex ones. For example, I once had a fourth grader in a class who had never learned his multiplication facts. I gave him a sheet of difficult number patterns to solve, many of which required multiplication for their solution. He taught himself to multiply so that he could solve the problems.

Spatial learners learn best through inductive or discovery techniques. There are inductive learning approaches in every discipline. In mathematics, discovery learning was fully developed in the 1960s in the "new math" curricula. Most of the manipulative materials in mathematics were designed to aid discovery learning (Davis, 1967; Piaget, 1971). Inquiry methods in science pervade most textbooks and science kits (Suchman, 1961). Bruner's *Man: A Course of Study* (1970) and Taba's social studies curriculum (Taba & Hills, 1965) are both organized around major conceptual themes presented through inductive techniques. In language arts, the Junior Great Books program focuses on the same approach. Orff and Suzuki methods in music stress pattern recognition and musical composition through discovery. The book *Curriculum Development for the Gifted* (Maker, 1982) describes several other examples of inductive learning for gifted students.

### **Adaptive Techniques That Work**

Following are eight adaptations of traditional teaching methods that have been found to be effective for serving nonsequential learners.

1. Visual-spatial children remember what they see and forget what they hear, so show them. Write directions on the board, on overheads, or on paper. Use visuals and hands-on experience.
2. Visual-spatial children are not step-by-step learners, so give them the big picture first. Tell them the goal of instruction and let them figure out their own way of getting there while the rest of the class is being taught.
3. If children have difficulty with sequential tasks but grasp complex concepts, give them advanced work, even though they have not mastered the easier work. Consider acceleration in some subject areas.
4. If children's fine-motor sequencing is impaired, handwriting will be extremely difficult for them, which will result in their not completing their assignments. Teach them to use a

keyboard as soon as possible and let them use a typewriter or (ideally) a computer for their assignments to the greatest extent possible.

5. Remedial techniques may not be effective, as they were designed for children with a different learning style; instead, teach visual-spatial learners to compensate for sequential weaknesses and poor rote memory (e.g., making lists, visualizing, using a word processor with a spelling checker, earphones, tape recorder, etc.).

#### 6. AVOID TIMED TESTS!

7. Use a sight approach to reading and reading material that is rich in fantasy and visual imagery.

8. Let visual-spatial children observe others before attempting new tasks.

9. Visual-spatial students should be encouraged to arrive at answers in their own ways, rather than be required to follow a step-by-step model. Before any methods are shown to them, they should be given the opportunity of devising their own methods of problem solving. Another enjoyable activity for them is being given answers to problems and having to guess the questions or guess the directions. This can be done in several subject areas. To avoid drill and repetition, they can be given the most difficult problems on a page to solve and be allowed to go on to more difficult material if they are successful. Their learning can be enhanced by allowing them to construct, draw, or otherwise create visual representations of concepts. Creativity should be encouraged in all subject areas.

Reading should be taught by means of sight words rather than phonics. Spelling can be enhanced by having the child visualize the words before spelling them. In language arts, quality of ideas should be graded separately from mechanics, as the child will probably have good ideas but may have poor sense of grammar, punctuation, and spelling.

A computer is a wonderful asset for the visual-spatial learner. It presents material visually, and the child is required to sequence commands in order to communicate with it. This reinforces the child's spatial strength while providing practice in sequencing skills. The computer thinks like the spatial child in many ways. It has no sense of time. It is an all-or-none learner, and it is a perfectionist. It only works when it has been programmed perfectly with all of the necessary information. The spatial child is highly motivated by the computer. It seems like a giant puzzle. It does not impose time constrictions, and it can be counted on to be perfectly logical. Its feedback is nonemotional and nonjudgmental. It never raises an eyebrow and says, "You should have known that!" And it provides privacy in learning and a feeling of safety for the introverted child.

Visual-spatial learners have incredible strengths - strengths that can be mobilized to help them be highly successful learners. When they are placed in the right environment, where there is a good match between their learning style and the way they are taught, they shine. School need not be a place of suffering for them: it can be a joy.

## **Current Successes and Future Directions**

Over the past 10 years, the observations summarized above have been found to be helpful to many families of gifted children and to the children themselves. As they became aware of the visual-spatial learning pattern, the children were able to view their differences as potential strengths rather than deficiencies, and children with sequential deficits learned how to compensate for them. We have had considerable success placing visual-spatial learners in schools for the gifted, and several private schools pride themselves on their ability to serve these children well. However, we have been less successful at getting them placed in public school gifted programs because placement decisions are often made on the basis of academic achievement rather than ability. This is a policy very much in need of reexamination, so that we do not lose those students who need differentiated education the most.

Many visual-spatial learners have been badly wounded in the traditional system. They have been made to feel stupid, lazy, defiant, and unworthy, all because their unique learning style has not been fully understood and appreciated. The damage to these children's self-esteem can be healed if they have the chance to work with caring, sensitive teachers who recognize their true potential. Children respond to those who believe in them. And there is good reason to believe in visual-spatial learners. If they do not get too discouraged in school, their performance may improve dramatically as they get older. Many spatially oriented learners suddenly blossom in puberty (Dixon, 1983); for others, the light bulb goes on in high school or college. One possible reason for this miracle is that the material finally becomes challenging enough to force the integration of the two hemispheres (Levy, 1982).

We have discovered that this learning pattern is often familial, and parents frequently report that they too "got smarter" as they got older. Most visual-spatial adults compensate well for sequential weaknesses and may excel in areas such as computer technology, aeronautics, physics, art, architecture, music, and pure mathematics. They tend to be highly creative in whichever fields they choose; they are the problem finders because they can see holistically. They are our "late bloomers," but we can recognize them early in life and allow them access to gifted programs. All that is required is recognizing their learning style and deemphasizing academic achievement as the entry ticket to special programs.

The research and clinical observations we have done so far just scratch the surface of this fascinating learning pattern; there are many unanswered questions and much need for additional research. Are there several types of spatial learners, some of which we have yet to discover? (Our preliminary research suggests that there are.) Are visual-spatial abilities sex linked? (Although current thought suggests that the pattern is linked to masculine hormones, our research disputes this.) What is the relationship between the visual-spatial pattern and introversion? Intuition? Creativity in adult life? I hope that this article will generate exploration into these and related questions.

## **REFERENCES**

- Baum, S (1984). Meeting the needs of learning disabled gifted students. *Roeper Review*, 7(1), 16-19.
- Bogen, J. (1969). The other side of the brain: II. An appositional mind. *Bulletin of the Los Angeles Neurological Society*, 34, 135-162.
- Bruner, J. (1970). *Man: A course of study*. Cambridge, MA: Educational Development Center.
- Chess, S. (1968). Temperament and learning ability in school children. *American Journal of Public Health*, 58, 2231-2239.
- Das, J.P., Kriby, J.R. & Jarman, R.F. (1979). *Simultaneous and successive cognitive processes*. New York: Academic Press.
- Davis, R.B. (1967). Mathematics teaching - with special reference to epistemological problem. *Journal of Research and Development in Education*, (No. 1).
- Dixon, J.P. (1983). *The spatial child*. Springfield, IL: Charles C. Thomas.
- Gordon, E.M. & Thomas, A. (1967). Children's behavioral style and the teacher's appraisal of their intelligence. *Journal of School Psychology*, 5, 292-300.
- Keirsey, D., & Bates, M. (1978). *Please understand me: Character and temperament types*. Del Mar, CA: Prometheus Nemesis Books.
- Kinsbourne, M. (1980). Cognition and the brain. In M.C. Wittrock (Ed.), *The brain and psychology* (pp. 325-342). New York: Academic Press.
- Levy, J. (1974). Psychobiological implications of bilateral asymmetry. In Stuart J. Dimond & J. Graham Beaumont (Eds.) *Hemisphere function in the human brain* (pp. 121-183). New York: Halstead Press/John Wiley.
- Levy, J. (1982, November). *Brain research: Myths and realities of the gifted male and female*. Paper presented at the Illinois Gifted Education Conference, Chicago, IL.
- Levy-Agresti, J., & Sperry, R. (1968). Differential perceptual capacities in major and minor hemispheres. *Proceedings of the National Academy of Sciences*, 61, 1151.
- Luria, A.R. (1966). *Higher cortical functions in man*. New York: Basic Books.
- Luria, A.R. (1971). The origin and cerebral organizations of man's conscious action. *Proceedings of the Nineteenth International Congress of Psychology*, 19, 37-52.
- Maker, C.J. (1982). *Curriculum development for the gifted*, Rockville, MD: Aspen.
- Myers, I.B. (1962). *Manual for the Myer-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Piaget, J. (1971). *Science of education and the psychology of the child*. New York: Viking Press.

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Schiff, M.M., Kaufman, A.S., & Kaufman, N.L. (1981). Scatter analysis of WISC-R profiles for learning disabled children with superior intelligence. *Journal of Learning Disabilities*, 14, 400-404.

Silverman, L.K. (1986). *Characteristics of introversion in children*. Available from Gifted Child Development Center, 1738 Pearl Street, Denver, CO 80203.

Silverman, L.K., Chitwood, D.G., & Waters, J.L. (1986). Young gifted children: Can parents identify giftedness? *Topics in Early Childhood Special Education*, 6(1), 23-28.

Suchman, J.R. (1961). Inquiry training. Building skills for autonomous discovery. *The Merrill-Palmer Quarterly of Behavior and Development*, 7, 147-169.

Taba, H., & Hills, J.L., (1965). *Teacher handbook for Contra Costa social studies. Grades 1-6* San Francisco: San Francisco State College.

Thomas, A, & Chess, S. (1977). *Temperament and development*. New York: Brunner/Mazel.

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