Tangible Symbol Systems

Major findings from: *Demonstrating the Benefits of Tangible Symbol Systems, an Innovative Use of "Low-Tech" Materials for Students with Severe and Multiple Disabilities*
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What are Tangible Symbols?

Children develop communication skills in a predictable manner. They begin by learning to use pre-symbolic means of communication, such as gestures and sounds, to let us know what they want and what they like or dislike. This communication is effective but limited. They have no way of telling us if they want something that is not present or to ask about something that may occur in the future or that happened in the past. They are limited to the "here and now". Children without disabilities quickly expand their options, learning to use "symbolic" means of communication, in the form of spoken words, that enable them to talk about absolutely anything and everything. Speech is a form of abstract symbolic communication. Speech is called abstract because there is nothing concrete that links a spoken word to its meaning: the connection is completely arbitrary. For example, when I say "tomorrow', there is nothing in that collection of letters or sounds that connects it to the meaning of the word. Because of this, abstract symbolic communication makes significant intellectual demands on the speaker.

Learning to communicate is often a challenge for children with severe disabilities. Some struggle to understand that gestures can be used to communicate. Others master gestures, but have difficulty moving on to abstract symbolic ways of communicating. The jump from pre-symbolic to abstract symbolic communication may simply be too big.

Tangible symbols consist of objects or pictures that are used to convey meaning. They provide a method of symbolic communication that is concrete (rather than abstract) because, unlike spoken words, they have an obvious physical relationship to their meaning. Tangible symbols look like or feel like whatever they represent. For instance, a shoe lace might be a good symbol for "shoe", or a picture of a box of cookies might be a good symbol for "cookie". Tangible symbols are not as demanding to use in terms of physical, sensory or intellectual abilities as are abstract symbols such as speech or manual signs. They may be useful for children with severe communication disorders because:

- They have a clear connection to what they refer to, so they make low demands on the user's intellectual abilities.

- They are permanent, so the user doesn't have to recall them out of thin air; the user simply has to recognize the needed symbol out of a permanent display of them.
- They can be picked up and handed to someone to complete a communicative act.
- They require only a simple motor response- they can be indicated by eye gaze, pointing or touching, rather than through highly developed fine motor abilities.
- Three-dimensional tangible symbols can be useful for people without sight.

The question

This research project grew out of an earlier project in which we explored the usefulness of tangible symbols as a communication method for children who are deafblind. The results of that research were extremely encouraging. All of the participants learned to use tangible symbols to communicate to some degree. This success naturally led us to wonder if tangible symbols would prove helpful for other children who experienced a wider range of disabilities. In this project we sought to answer two questions: (1) can tangible symbols provide a useful means of communication for children with a wide range of disabilities; and (2) might some children who learn to use tangible symbols move on to using abstract symbols?

Who participated in our research?

Our project involved 41 children from 9 different public schools in Oregon. They ranged in age from 3 to 18 years, but most of them were age 6 or younger. Their disabilities and their communication skills varied widely. Many of them experienced autism, sensory impairments, orthopedic impairment or seizure disorders. All participants demonstrated intellectual limitations. A few of the students did not use any gestures, although most of them had at least a rudimentary use of gestures. Most of the children did not use any abstract symbols to communicate, although seven used a few word approximations or tangible symbols.

What did our research look like?

We administered assessments to determine what behaviors the children were using to communicate and, if they seemed to understand symbolic communication, what sort of symbol they understood. Then we created sets of tangible symbols for the children who were clearly ready to begin to use them. For children who had very little or no pre-symbolic communication (using gestures, facial expressions, body movements to communicate), we concentrated on improving their pre-symbolic communication before we tackled the use of tangible symbols.

Our research staff worked directly with each child in his/her classroom. The interactions were one-on-one and lasted approximately 15-20 minutes each school day. Initially, interactions with a child focused on building rapport, exploring what activities and materials were most appealing to the child and noting how they expressed themselves. An intervention program targeting either gestures or tangible symbols was then planned for each child. Children who already used some abstract symbols were encouraged to use them also.

We followed procedures outlined in the book "Tangible Symbol Systems" (Rowland & Schweigert, 2000). Typically, intervention would consist of presenting a child with a choice of toys (usually two or three) that the child liked to play with. For the child who was not ready for tangible symbols, we concentrated on gestural behaviors to indicate a choice of the desired items. For the child who appeared ready to learn to use symbols, the child first indicated which he or she wanted through gestures. Then we removed the unwanted items and presented a choice of symbols including one for the desired item. If the child chose the wrong symbol, we pointed out the correct one, but the child did not get to play with the desired item. The child would then be presented with a new choice. When the child chose the correct symbol, the child got to play with the item for a short while. The programs were frequently evaluated and adjusted to make sure the child was challenged but not frustrated, remained interested and was progressing.

How did we determine whether the students learned to use tangible symbols?

In order to answer the two questions which were the basis of this research project, we had to collect data and analyze it. During each session with a child the staff member took data on how the child performed. The data collected included:

- the number of symbols introduced,
- the number of symbols acquired (that is, correctly selected from a group of at least three symbols 80% of the time without assistance over two consecutive days),
- the number of symbols presented at once,
- the number of symbols used together in one expression,
- the function of the symbolic communication (usually to request),
- how abstract the symbols were,
- and the number of sessions required for each child to demonstrate mastery of a new symbol.

This information gave us specific knowledge about the progress of each child. It enabled us to adjust the programs to keep them challenging but not overwhelming as the child progressed or to make programs easier if the child was having difficulty learning. It provided us with information about each child's progress over time. It also provided us with information we could use to draw conclusions about the group as a whole.

Results

As has been noted before, the children in our research showed a wide range of disabilities, entering our project with varied levels of communication skills. As we began to evaluate our data, we found that that the results of the interventions with the children naturally divided them into three groups based on outcome.

- Group 1 included six children who did not learn to use any tangible symbols.
- Group 2 included 25 children who learned to use some tangible symbols, but did not move beyond that level of communication.

- Group 3 included 10 children who not only learned to use tangible symbols, but subsequently learned to use some form of abstract symbols, such as speech or sign language.

We discovered that the level of communication skills that the students had when they entered our research heavily influenced their success. Of the children who entered the project without any intentional communication behavior, none learned to use any tangible symbols. On the other hand, 100% of those who entered with some sort of intentional pre-symbolic communication learned to use tangible symbols.

What we learned from the intervention data

We will discuss the results of our project in terms of the three groups described above. In most cases, we are comparing the performance of the children at the beginning of our involvement with them to their performance at the end of this involvement.

How many tangible symbols did the children acquire over the course of the intervention?

- Group 1: none
- Group 2: They started with no tangible symbols and ended with an average of 3.
- Group 3: They started with no tangible symbols and ended with an average of 22.

How did the size of the array of tangible symbols from which the children chose change over the course of the intervention?

- Group 1: They did not acquire any tangible symbols.
- Group 2: They started with 0 and ended with an average of 7 symbols in an array.
- Group 2: They started with 0 and ended with an average of 17 symbols in an array.
- Ten of the children in Groups 2 and 3 ended with communication books that contained from 10 to 75 symbols.

What length of symbol combinations, or symbol "sentences", did the children learn to use over the intervention?

- Groups 1 & 2: On average, these groups used only one symbol at a time.
- Group 3: They progressed from one-symbol combinations to an average of three-symbol combinations.
- Eight students were using expressions with two or more symbols at the end of intervention.

How many communicative functions were the children using by the end of the interventions?

- Groups 1 & 2: These groups averaged one function.
- Group 3: They progressed from an average of one function to an average of three.
- All students who used symbols initially used the symbols to make requests, but nine students, (two in Group 2 and seven in Group 3), learned to use tangible symbols to express two or more functions.

How many abstract symbols were acquired by the children by the end of the intervention?

- Group 1 & 2: These groups didn't use any abstract symbols.
- Group 3: These students averaged 2 abstract symbols at the beginning of intervention and concluded with an average of 40. Two students began using manual signs and one student started using printed words. Seven students began with some minimal speech approximations or speech, mainly single words, with an average of three words. For those children, speech increased to an average of 53 words.

How did the acquisition rate change over the course of the project? (The acquisition rate is the number of sessions required for a student to master use of a new symbol by our criteria. A lower acquisition rate indicates faster learning.)

- Group 1: No symbols were acquired.
- Group 2: The average number of sessions for this group to master a new symbol at the beginning of intervention was 8; by the end of intervention the average was only 3.
- Group 3: The average number of sessions for this group to master a new symbol at the beginning of intervention was 4; by the end of intervention the average was 2.
- It was clear that the students in Groups 2 and 3 demonstrated a "learning to learn" effect; once they had figured out how tangible symbols worked, they acquired them faster and faster.

Did mastery of tangible symbols discourage children from using speech?

- One thing we learned from the project as a whole was that each step a child accomplished in learning to communicate helped provide the tools for their next step, whether that step involved progressing from gestures to tangible symbols or from one form of tangible symbols to another form or from tangible symbols to abstract symbols. This was true even when speech was involved. Seven of our students started with some speech approximations or minimal speech. Using tangible symbols did not appear to cause them to stop using speech or learning new words. All showed dramatic increases in their rate of speech and the size of their vocabularies over the course of the project. Their communication through all forms, whether speech, tangible symbols or gestures, also increased. For five of them, speech later became their primary form of communication. For the remaining two, their use of speech continued to increase, with the use of tangible symbols appearing to support speech development.

What happened after the children left the project?

We were able to follow up with 24 of the 41 students we had worked with about a year later by visiting them in their current classrooms and observing their communication methods. We found that the three children who had been using gestures at the end of the project continued to do so. The other 21 students were using tangible symbol systems at the conclusion of their participation. Eleven of these students continued to use the same systems and seven had

progressed to a more abstract symbol system. However, three no longer used any symbolic system at all. These three students' communication systems had not followed them as they moved to new classrooms or schools. These three children had systems that required a lot of effort from a communication partner. Two of the students communicated through eye gaze. The third was totally blind. The higher level of involvement required to enable these children to communicate may have played a role in the failure of new classrooms to maintain their systems. Unfortunately, access to these systems is not under the children's control. They are dependent on the world around them to be able to communicate.

What does all this mean?

As we completed this project and surveyed our results we were able to draw three main conclusions:

- It was clear that children exhibiting a wide range of abilities could learn to use tangible symbols effectively as a communication system.
- For a number of students, acquiring tangible symbols provided a bridge to the use of more abstract symbols.
- We discovered new information about the important role pre-symbolic communication plays as a precursor to using symbolic forms of communication.