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# A Children's Realm: An Experiment Using Life-Sized Manipulatives to Expand Exploring and Learning Opportunities for Children

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A CHILDREN'S REALM: AN EXPERIMENT USING LIFE-SIZED MANIPULATIVES TO  
EXPAND EXPLORING AND LEARNING OPPORTUNITIES FOR CHILDREN

A Synthesis Project Presented

By

ROBERT E. DRAKE, III

Submitted to the Office of Graduate Studies, University of Massachusetts Boston, in partial  
fulfillment of the requirements for the degree of

MASTER OF ARTS

August 2001

Critical and Creative Thinking Program

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## ABSTRACT

### A CHILDREN'S REALM: AN EXPERIMENT USING LIFE-SIZED MANIPULATIVES TO EXPAND EXPLORING AND LEARNING OPPORTUNITIES FOR CHILDREN

August 2001

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Directed by Assistant Professor Peter Taylor

In this synthesis I describe a 'Children's Realm' in which middle school children can safely explore and interact with a variety of physical phenomena typically reserved for the adult world, such as building and driving a car. A Children's Realm is an experiment. It is an attempt to not only design, but engineer a unique environment for middle school students to explore and learn. It is based on providing the complex tools I feel children need to do this kind of learning on their own. These complex tools I call Life-Sized Manipulatives or simply LSM. I highlight the importance of LSM in a Children's Realm and how the goals of the Children's Realm depend on them. This paper is a work in progress that represents observations that began when I was a child trying to learn but failing to learn. It continues through a process of learning from failing to teach, and collaborating with the faculty and colleagues of the Critical and Creative Thinking Program at University of Massachusetts-Boston.

I show that my ideas are well conceived by connecting them to the works of others before me. To do this I make connections between the Children's Realm and Adventure Playgrounds, The works of John Dewey, research done in peer to peer relationships, and highlight some of the

key features of problem-solving pedagogies. I make these connections as powerfully as I can in order to convince others and hopefully secure funding to continue collaborating with others and further this research.

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## CHAPTER 1

### ENVISIONING A CHILDREN'S REALM

#### Childhood Restrictions.

Middle school children have an amazing number of restrictions that limit their exposure or interaction to a large variety of everyday physical phenomena. Among these limits and rules there are things children are not allowed to try because they are: too young, too short, not strong enough, not weigh enough, not smart enough, cannot afford it, cannot handle it, or simply not given the chance. Other restrictions are based on factors such as socio-economics, privilege, culture, geography, gender, race, legal issues, and ability. While I agree that many of these restrictions and all of the safety restrictions are necessary, I also feel that middle school children have an interest in these phenomena that occur years before these restrictions allow them to discover or learn about them. This has created a paradox which has occupied my personal and professional interest for a long time. I agree with these restrictions in the *adult* environment they were formulated in. For example, allowing a child of middle school years to drive a car on real roads in a real city would be nightmarish. But there are children of the same age who race go-carts, which are just as fast as these cars, in races planned and designed just for children of this age group. This same strategy is applied to a host of typically adult activities to allow children who otherwise wouldn't get to do something, to try it out in a safe way, specifically designed with their safety and enjoyment in mind. As in the example above, it would cost more than most families of children can afford for the specially designed car and the sponsorship to allow their child to participate. This brings us back to our dilemma, there are a few specific exceptions to



the rules above, but now it is privilege and socio-economics being the restriction. But all hope is not lost... I have been working on an experiment which I hope will provide some of the answers.

### Creating an Environment to Circumvent These Restrictions.

I have been working on the logistics of establishing an environment that will allow middle school children to explore and learn about physical phenomena that is normally restricted to adults for several years now. I have come up with what I hope is a viable experiment that I would like to try in an attempt to expand the opportunities that are currently available to this group. This environment I call a Children's Realm. When I speak of children interacting in it, I am referring to middle school aged children. It is this group that I feel is most vulnerable to the limited opportunities, which I outlined above. This experience comes to me both as a child myself years ago, and now again as a teacher of this age group.

I feel the many opportunities that are created for this age group are too few and far in between, leaving most students with out the means to benefit from such programs. Using the specially modified go-cart as an example, I am trying to re-engineer a whole environment which would, in addition to other support systems and staff, allow children to discover and learn many of the physical phenomena now limited to adults—all in one place, the Children's Realm.

### A Children's Realm.

When I envision the Children's Realm, I see a small city or town run by and for children interacting over a variety of media, business relationships, friendships, and co-worker relationships. Forms of peer tutoring, peer collaboration, and peer cooperation abound with older and more experienced children helping the younger least experienced with new tasks,

ideas, and challenges. I see children taking their own driver's education classes, and driving cars and trucks of their own design every which way. A line of people at the bank trying to get a business loan to start a business, and still others at the 'university' either teaching or learning something new. A host of e-business firms are helping some children set up a home page, while teaching others how to do this as an apprenticeship. A city council or government, complete with elections, and the power to change things is made completely of children. A police force, an emergency medical system, lawyers, and doctors, all under the tutelage of professionals who volunteer their time, are also all children. Even a subway is student built and run. Yes, I see it all and I believe it is possible with the use of a large-scale construction kit I am developing, called Life-Sized Manipulatives (LSM). This LSM and the environment (Children's Realm) can be safely done with the backing of trained adult staff who understand and believe in what children can do given the opportunity to create, experiment, and test their ideas.

A Children's Realm is a place where children can build a city in their image from the ground up (and even underground as well.). They are provided with the materials (LSM) to safely create the infrastructures: build buildings, cars, cranes, bridges, and just about anything else they think they will need. There are children run versions of societal infrastructures such as banks and other institutions which make it possible to do just about anything we adults might do in the adult world—or something entirely different. With the LSM, children can wire their houses, or businesses; design new equipment to do specific tasks; design new parts of the LSM, and even take out a patent. With the functionally similar, but safer simulated tools and infrastructure of the larger, preexisting society, children will have more opportunities to learn and understand mechanical and spatial relationships they experience in everyday life.

The Children's Realm is not a school and it is not a children's museum, but much more than both together. It is an environment of discovery and learning opportunities opened up for children providing them with the ability to build, create, and work with materials and supplies typically only adults interact with and have access to. By providing children so much intellectual freedom, practice using critical thinking skills, and the ability to pursue their interests freely, my hope is that the Children's Realm will become a unique venue for children who love exploring and learning by doing. Of course, these examples of what children would do above are my own ideas of what could transpire (what I would have done). Children may very well have a different approach or ideas in mind. The examples I use in this paper will reflect the structure, government, and materials of the environment I grew up in. But don't hold me to this, as I cannot fathom the incredible ideas today's youth will bring to light.

#### A Children's Realm as a Viable Experiment.

Children should have a life-sized construction kit designed and created to foster an environment that will allow them to discover and explore a world of physical relationships and social structures. The LSM would allow children to build just about anything they can imagine, and the Children's Realm would give them the space guidance and support necessary to do it. In order to demonstrate the credibility of these ideas, I have designed an experiment. The first stage of this experiment is comprised of this paper, and a small prototype LSM I am working on. The paper and prototype are both important tools used to get to the second stage, which is convincing others that this is worthy of further investigation, and trial. After this second stage is successfully passed, implementing the CR should be the third and final stage.

In Chapter 2, I begin with how I came to this idea. I use my experiences as a child with a unique learning style who failed to learn, but learned from failing to learn, who then dreamed of

this kind of environment. I illustrate my experiences in successful and unsuccessful teaching and the rationale behind those actions. Finally, I show the flow of my thinking from hands-on learning to discovery and experimentation with Life-Sized Manipulatives.

In Chapter 3, I demonstrate why Life-Sized Manipulatives are needed and how a Children's Realm will help maximize the benefits children may gain. I show what I perceive these benefits to be and why I feel they are important. I take readers on a hypothetical journey through *my* Children's Realm as an example to help readers visualize the kind of environment I hope to create as I experiment to expand exploration and learning opportunities for children.

In Chapter 4, I explain how a Children's Realm is more than just the materials that comprise the Life-Sized Manipulatives. I demonstrate that these materials are tools in and of themselves as well as tools that can be used to realize bigger ideas about social organization of the Children's Realm.

In chapter 5, I show where my ideas and those of experts before me overlap and connect. I hope this lends credibility to my work and shows that it is well conceived so I can earn the support of my colleagues and the larger education community. By obtaining the support of the community and my colleagues, I hope to receive the funds necessary to set up a trial of this experiment.

In Chapter 6, I break establishing a Children's Realm into steps necessary to effectively implement and evaluate the potential of my ideas. I also show that there are important stages to effectively developing the LSM successfully. Finally, I present some initial funding goals geared toward these steps and what such funds might be used for.

In Chapter 7, I reflect on my experiences in writing this synthesis in the Epilogue.

## CHAPTER 2

### LEARNING FROM FAILING TO LEARN

#### Personal Experience.

I became profoundly deaf when I was four years old. Although I had already acquired speech by this time, I no longer had passive access to spoken language. This experience transformed me into a visual thinker and learner. The first transformation I went through by being a visual thinker was to turn my communication inward toward myself, rather than outward towards other people. I also began to look at things, and why they were doing what they were doing. For things to make “mechanical-spatial” sense I needed to actually *see* how they were working. Soon my parents and three sisters noticed that there were many household items missing. Further inspection of my ‘play space’ showed the telltale signs of them all being taken apart and the parts rejoined to make other things.

Among some of those ‘other’ things I created you would find the “ATM machine”, Kool-Aid Dispensing machine (complete with five flavors), and an Air Compressor-Assisted Underwater Breathing Apparatus (ACAUBA). Although my parents were amazed with my ability to create whatever I had in mind, they were less than thrilled to find that the missing hairdryers, tools, and other miscellaneous household items were the building blocks of such inventions. After blowing out the power to the house a few times, and learning what 120 volts felt like flowing through my limbs, my parents convinced me that my safety was an issue and that I should confine myself to more ‘appropriate’ activities until I was more skilled. I yearned for a place where I could explore my ideas. There was no such place to be found. Without an

environment to continue, I ceased my pursuits and rejoined the 'typical' activities for my age group.

### Learning From Failing to Teach.

More than ten years later I got an opportunity to rectify the suppressed, curious child in me- not just by exploring, but also by teaching and exploring with others as an educator. As an excited undergraduate student, I applied for and received an internship teaching at an academic enrichment summer program that emphasized hands-on learning and creating. The successes and failures of 6 years of experiments in the classroom teaching and learning eventually led to the development of LSM.

The summer academic enrichment program where I first taught served students entering the 8<sup>th</sup> and 9<sup>th</sup> grades who came from more than 40 states and 40 different countries. It was and still is the largest program of its kind emphasizing hands-on learning in a classroom environment (see <http://www.explo.org>). I was to design original curriculum and had access to curriculum specialists to insure my curricula met the needs of the program. I decided this program would be a good place to begin since they afforded me the freedom, space, and time I needed both to test my ideas and allow others to test theirs.

I decided to teach Anatomy that first summer, and was very excited about exploring further an idea I had about teaching it that differed remarkably from the way I learned it in college. I wanted only a laboratory. Books, computers, models, and other sources of information were used for reference and research only. I was trying to bring both simplicity and a sense of reality to the body we were going to study. If only we could build a body like you would build a car, by bolting it together, we would have a much better appreciation, and understanding of our own bodies. But the body was not a car and it does not bolt together. I

used other materials that gave a crude resemblance of a body such as clay, fabrics, tubes, a plastic skeleton, and rubber bands. The children had a blast, but I was disappointed. I wanted to explore the body with much more than a crude resemblance. Without a budget to match, it was an impractical task. But the success with the children had inspired me to continue.

The Junior Emergency Medical Technician (EMT) course I taught the following summer was very successful- even though we did not get the 'real' ambulance I wanted and had to retrofit a van for the purpose. It was successful in part because I wanted the children to learn how, when, and why to use all the actual EMT equipment that was standard. I was lucky to get the Boston Emergency Medical Service (EMS) to provide me with a full complement of their equipment for this purpose. It was part in-class, small group practice and training as well as critical thinking exercises in why we do what we do, and what if we do not, etc. This was supplemented with the 'real' thing in the field. Everyday I would have staff and other volunteers dress a complete accident scene with real people, props, fake blood, and screaming bystanders. The children were responsible for responding to it all-their own personal safety, containing and bringing the accident scene under control, bystanders, triage of victims, stabilization of symptoms and transportation to a 'local' facility. The children exhibited an energy I have never seen before and this emboldened me. The success of this course made it the most desirable course offered in the program.

The third year I consider my most ambitious and the one from which I learned the hardest lesson. I came with plenty of energy and an agenda. This year's course was the U.S. Coast Guard Course. It was to be complete with a two story Coast Guard Patrol House in the middle of Lake Waban, a public access lake in the town of Wellesley. It was going to be built by the children for the children. And it was going to be done on a budget of about \$1,500. Prior to

arriving I received grants to provide all the barrels I would need for the Coast Guard Station as well as some other miscellaneous equipment. All of the budget money went into lumber and I had all the Coast Guard Equipment compliments of the Point Allerton U.S. Coast Guard Station at Hull, MA. Then things went downhill. Despite the simple design, and all my free time invested in it, we never finished the coast guard station by the end of the class, and did not get to do much, if any, real Coast Guard work. It seemed to take all the energy I had supervising the use of power tools the children were using to construct the station. The students still had a great time, and learned a lot about construction, even though that was only half of the course's planned focus. I was frustrated and trying to visualize what I could have changed to make all of the goals possible. I decided I was going to try this same area of construction again within a different domain and see if I could succeed where I felt I failed that summer.

The following summer, my fourth one at the program, found me teaching a shipbuilding course. I started much earlier this time and even cut down an abandoned house to make sure I had the amount of wood I needed. It was another long frustrating summer and there just did not seem to be any way I could divide my attention between different power tools and still insure the safety of the children. They were highly motivated and I felt I was letting them down. Near the end of the course we had 3 different unfinished boats each about 25 feet long. On the last day, we regrouped and cut one of them in half, sealed it up and carried it to the lake. The children loved it, but I thought the class was only moderately successful. I was still very frustrated.

I was offered a position as Curriculum Specialist for the following summer and spent my time observing the courses of others and incubating my ideas over and over. What was I doing wrong? What thinking did I need to change? I did not think my ideas were too ambitious, and felt very strongly that constructing big things like the ones I tried are what make children excited



and happy. They didn't even have to be "big", but in general the bigger it is, the less the opportunity any of these children would have had otherwise in doing it. These kinds of courses were what I felt children needed to start them down the path that leads to a life-long love of learning. Successful courses would deliver a big, powerful experience of learning and enjoyment at the hands of the children themselves. It was during this incubation stage that I discovered my own answers.

### The Beginning of LSM.

I realized around this time that I could have cut down a neighborhood of houses and still failed. The problem was not the materials (which I always seemed to be able to scrounge). The problem was *unprepared* materials. We spent about 90% of the time cutting, drilling, measuring, and joining the wood for all of these projects. We only got 10% of the time to design, discuss, or interact with them outside of preparing them for use. With only two eyes, I could not supervise more than one person, two at the most using power tools, which kept everyone else waiting, and therefore wasting the precious time we had. I also realized that even 15 of me could not change that dynamic for a large project. I wanted their ideas designed, built, tested, redesigned based on test results, reconstructed to a better design, and finally retested. That was the sequence I felt was necessary for real learning to occur. There was just not enough time for this kind of structure if we had to prepare the materials during class time as well. I could not prepare the materials myself before class since I did not know what the students ideas were until they actually designed the boat or whatever they planned to build.

This propelled my thinking into finding some materials that were flexible--flexible in design, flexible in joinability, flexible in their use, etc. I need something that would seldom require the use of power tools. The problem was--there was not anything like that on the market.

I then began to design LSM. I called them Life-Sized Manipulatives because they reminded me of small construction toys like Lego®, Erector-Set®, etc., which were all very versatile and joinable and allowed the builder flexibility in the decision of what they were building. However, we were not going to build a 40-foot boat out of Lego®. We needed something BIG, but not any less versatile. At the end of this first of two Curriculum Specialist years at that program, I was admitted to the Masters Program in Critical and Creative Thinking at UMB (see <http://omega.cc.umb.edu/~cct>). It was here through the help of colleagues that I was able to continue my pursuit of the heretofore elusive LSM.

### Collaborating With Others.

The Critical and Creative Thinking Program allowed me to apply the pedagogies I was learning in the program to what I was working on outside the program. I had an opportunity to share my ideas with colleagues over a variety of different courses, methods, and media and generate the work presented in this paper. Most importantly, I learned that in order for me to continue the development of these ideas, there were several important steps that would lead to convincing others my ideas are worthy of further investigation. I would need to build upon similar works of others before me, and use both those works and collaboration with others to lend credibility to my ideas. I would need a plan to implement the process in steps that are each well thought out and have a means of evaluating their success. Finally, I would need to use these works and successful collaboration with others to convince those with the financial resources or means of funding further research and development.

While collaborating with others at University of Massachusetts-Boston, colleagues have brought to my attention several issues that needed to be address in this paper. These questions tended to be logistical in nature but no less important. How do I handle children with

## CHAPTER 3

### LSM: THE BUILDING-BLOCKS OF A CHILDREN'S REALM

#### LSM.

The Life-Sized Manipulatives are what makes the Children's Realm possible, and the Children's Realm, in turn, is developed to maximize the benefits from the LSM. Now I would like to discuss the criteria for what makes the LSM possible. The first requirement for an LSM is to be economically feasible. This means, among other things, that it has to be completely reusable; in the same way a Lego® brick is reusable. There should not be anything that you put together than you cannot take apart and use again-- nothing permanently fixed or bonded together. This enables the children to constantly revise, rebuild, change, modify, and reconstruct what they are building and creating while saving money and waste at the same time. This also allows the Children's Realm to grow as more LSM are made and added to the existing infrastructure, which, in turn, allows more buildings, cars, bridges, and other ideas the children may have to be built.

The second requirement is for the LSM to be practical- to have a standard form of attachments. Lego® are practical because they can snap together in an almost infinite number of arrangements and structures. Once this standard attachment for LSM has been set, it would be relatively straightforward to convert anything we wish to add to the LSM in order for it to 'fit'. For example, if I needed to add a winch to make an LSM crane, I would simply weld or attach a metal plate that has these standard attachments on it to the base of the winch--such that it can be attached almost anywhere on an LSM. With this standard, the children will have a basis for

designing their own equipment simply by following the standard schematics. Suppose a child says they need a specific piece of equipment--one that is not currently included in the LSM. They then have the option of designing it, within the standard schematics, such that now it is a compatible part of the LSM and available to all when this person is done with it.

The third requirement of the LSM is that, for the safety of the children, it must be engineered to take the forces and stresses that are going to be placed on them. If a part of an LSM is going to be used in a crane that is going to build a bridge, then both the crane and the bridge LSM parts must be engineered such that they will withstand those forces with a large margin for safety. Ideally, from an engineering point of view this isn't possible, there are going to be limitations that certain pieces or parts of the LSM are going to have. In order to safeguard against this, we go to our fourth criteria I used in designing the LSM.

The last criterion I have at this stage of development (there will be more when I discover them) of the LSM is that it comes with a set of "codes", that explain the limits of certain pieces of the LSM under certain conditions. For example, if a construction company of the Children's Realm is going to build a crane, it will have to follow and understand the codes to know how many members are going to be needed in a certain part of the crane in order to lift so many pounds, etc. The 'codes' will be the definitive work for anyone working in any capacity with the LSM and all children will be trained to use it competently. Finally, as a check and balance against the mistakes that children are expected to make, there will be code 'inspectors' (e.g., older, more trained children and staff at the Children's Realm). The staff will make sure that each piece of heavy equipment or building that is made up of LSM, meet or exceed the codes before being put into use. (In the real world I just did this for the little shop I built to further my research on LSM.) It is also important to point out that these criteria are fluid. Because I cannot

possibly conceive of what the children will build with this LSM, the codes will be written as we learn more about what interests children and in order to safely accommodate new ideas when they arrive. (See Appendix p. 38, which shows pictures of the LSM prototype in action.)

### A Hypothetical Journey into a Children's Realm.

To help you visualize such an LSM, let's take a hypothetical journey through a Children's Realm. Imagine a place of about 100 acres of rolling hills. Most of this land is enclosed within aircraft hangars, warehouse buildings, or other forms of high ceiling, clear span enclosures. With the land enclosed and sheltered from the elements and weather, our potential problems go down and increased control goes up exponentially. After we clear 'customs' we hit the beginning of Main Street. We notice that this street is made out of those flexible, yet sturdy, puzzle-fitting mat pieces that you would find at a local gym. They are in black, and use an easy on/easy off yellow tape for the median. This way the road is not permanent and can always be changed according to the needs of the city council, or whatever group controls the planning of roads.

After waiting at the bus stop for about 5 minutes, a long, electric golf cart-like bus pulls up. The bus driver is a person in 7<sup>th</sup> grade, who took and passed a driver's education course for commercial drivers. Because the maximum speed is only about 20 miles per hour, it takes us about two minutes to get to the heart of downtown which is bustling with children going every which way. It is a sight to behold, a 'real' miniature city. Picking up a copy of the local paper, we find a variety of job postings, events, classes being offered, and of course, the daily news articles. Getting hungry, we look up and down the city street we are on and spot a few restaurants. They are also bustling with children, both workers and clients. The whole city seems like a giant erector set. Walls are made of lumber with holes in it to be bolted together,

and walls are made out of a kind of fireproof canvas stretched and snapped into place. Probably took one or two days to build one of these restaurants- if that. The food is pretty good and we realize to our dismay that they do not take U.S. currency. One person from our group goes across the street to a bank and according to the 'exchange rate' gets Children's Realm currency for U.S. dollars. After returning and paying, we step outside to explore some more.

We find a tour company that specializes in informative tours of the Children's Realm, and after a while we are on the outskirts of the city. Along the way we notice a wide variety of vehicles. Most use an electric golf cart chassis that are modified using the LSM, which is the same kind of equipment that makes up everything here. Each car seems to be designed for a specific purpose, some are for carrying people, like the tour car we are on now, and others are for police, firefighters, and even ambulances. We passed a group of fire fighters practicing with a real fire and what looked like a real fire fighter who was training them. We are told that there are a lot of professionals here, for an hour or two a week and training children to function in the equivalent roles in the Children's Realm.

Along the outskirts of the city it seems much less developed. There are construction companies here and there with a few residential neighborhoods scattered around. There is a big crane up ahead working on what appears to be a half finished bridge. There is a small trailer for the company designers or engineers and workers are all about in full construction dress, i.e., hard hats, boots, and harnesses. It seems to be pretty well organized. The tour guide says that the crane operators are rare and require a lot of training. This one is an 8<sup>th</sup> grader who has been running this particular crane for about 6 weeks. There are a number of adults around as well, but they seem to be more low-key and offering advice when asked or when they see potential 'code' violations.

The river over which the bridge will cross seems to have been strategically placed. It cuts the CR in half and is challenging the city council to come up with a way to use the land beyond--hence the bridge being built. We turn back and head toward the downtown area. We get dropped off across from the CR 'university' and see there are a lot of classes being offered at all times of the day and evening. They are taught by both professionals and children alike and all the classes are free for the children. We arrive on time for an open 'utilities' discussion. This is a great way to learn about the infrastructure of the Children's Realm. It is taught by a 9<sup>th</sup> grader on the city's Utility Inspection Board, who enjoys teaching.

He begins by telling us about the power systems in the Children's realm. The connectors and wiring are all contact safe, and it would be difficult for children to get a 'shock', even if they tried. The wires are all of the heavy-duty power cord consistency for long life and reusability. There is no real 'wiring' to be done since each cord is pre-wired and color-coded. They simply snap together like a toy, and they have power. The same kind of safety connectors have been installed on everything that requires power and, as such, it is safe, predictable and convenient from the 'power' companies that do the installing to the end-users who need the power.

The water arrives just as simply having been distributed throughout the city in both large and small simple connector hoses, like those used to fuel aircraft. All hoses are kept contaminant free; in fact, there is a water quality-testing group here at the CR University that monitors the water quality. There are essentially no tools needed as most connectors are can be snapped on or off with ease. Both the water and electricity are controlled full-time by people watching and monitoring its use. Streetlights have the same system as ours and appear to have been built by a local business that makes the street lighting equipment. The president of that company, a 6<sup>th</sup>

grader, holds the patent for its design. The lights are controlled by children from a central control area.

All wastes except for bathroom wastes are collected in drums that are emptied by another company. Only the downtown area has an actual 'main' drain. But some of the companies are electing to use just the drums since the drum-draining company offers competitive rates compared to connecting to the city main. The toilets are the compost-type and are nearly odor free. One group of students is negotiating for a grant to design special parts to build a drivable underwater submersible. There is a trade office that is staff run and they apparently deal as the go-between for inside (CR) and outside (non-CR) businesses. This lecture, which included a lot of the utility parts for demonstration, concluded and we returned to the Customs Office, where we checked out of the Children's Realm and returned to life outside of the CR.

An LSM part or member is a specialty-designed piece of hardware. It should be general enough to be used in just about anything a child could need, and flexible enough to be used for a very specific purpose. As listed above the four criteria I have used up to this point of a well-designed LSM are 1. Economically feasible (reusable). 2. Practical for its intended use (standard attachments). 3. Engineered to take the forces and stresses it will be subjected to. 4. Incorporated a 'code' in order to be used properly in all of its potential applications. With these initial criteria met, I can begin the process having children interact with the LSM and begin the long evaluation and evolution of the LSM into a powerful new learning kit.

All of these pieces of equipment-- the roads, the vehicles, and the parts that comprise them--are parts of the LSM. Some are everyday equipment integrated into the LSM for safe use by children in the Children's Realm. They are mostly the same things we use in the adult world with the exception of equipment not found in the adult world because the children have designed



or hold patents for it. Which types of 'everyday' equipment will they need? You will not know until they ask for it. The above equipment just happens to be what I imagine there would be in such a CR.

## CHAPTER 4

### THE CHILDREN'S REALM IS MORE THAN LSM

The vision of the Children's Realm presented in the previous chapter shows that it is intended to be more than a large, versatile, construction kit. It is even more than the infrastructure for the social organization of the Children's Realm. It is intended to foster a particular kind of learning. Let us look at a car, for example. When children first arrive at the Children's Realm and realize that there are many options available to them, i.e., take a driver's education course and learn how to drive, I assume they will be excited. The students will also realize, upon further investigation, that an existing car in the Children's Realm can be completely redesigned or built from the ground up to their tastes. The result, I hope, will be fascination and curiosity as children build their cars in a variety of designs and for a variety of uses. Children will hopefully feed off each other's innovations and borrow or trade ideas among themselves.

Once they become satisfied with their designs, I imagine they will spend more time driving them and less time modifying them. Soon all they are doing is driving them. They have mastered the car, its inner workings no longer a mystery to them, and are now focusing on its uses. The car has in a sense been made into a tool- it gets them from one place to another, more easily than walking say, to their new job at the construction company. The first project for the new employees of this company is to design and build a crane. The crane is needed to help with some of the large contracts just received, say, to build some downtown buildings. Once again, the crane is now the focus and the 'toy' for which their attention is directed. The students play, design, and redesign until they are satisfied with their results. Once the crane is built and

approved for use--with the codes mentioned earlier, it also, becomes transcended and the crane is now a tool from which buildings, bridges and other larger structures can now be made.

This is not to say that these steps *will* happen to each child as they arrive at the Children's Realm. For some children, transcending the manipulatives will not be an issue for them yet. Let us say a child comes to the Children's Realm with a specific agenda, for example, to run for the city council. She might not need a car and may already have an office that is set up and waiting for her. She would be working with the manipulatives more indirectly, or through others. Let us assume this person is on the committee for the development of roads. This child would probably spend a lot of time talking with others, investigating the layout of the land, maps, codes, and studying surveying data from the firms the city contracts to do this, etc. Voting, meetings, and other tasks will probably take precedence over actual hands-on use of the LSM. In this sense this student has not mastered the LSM yet, but instead is working in a more social and organizational sphere, which exists within, around, and because of the infrastructure created out of the LSM. Perhaps at some point this will change if the child decides to change their occupation, focus or project.

When I speak of transcending LSM, I mean going beyond them. For example, if you build a crane out of LSM, then build a construction business around it, that would be transcending the LSM, or using it as a stepping stone to go even further. The same can be said the other way around-where you would start the business first, and then build a crane to support it. When students can use the LSM, not in and of themselves, but within a larger social construct, they are going beyond the materials- seeing how the larger social fabric interacts.

The LSM are the physical materials that allow the Children's Realm to be built, but in building this, the materials are transcended when relationships are developed around the LSM.

The LSM need to be both present and ignored. For example, a city council, which is comprised of people working for the people, need not have a building to make decisions. But having a building lends legitimacy to the council, and a sense of place to the members. Although the kit and the infrastructure are separate in this paper for clarification, they are intricately interwoven in practice.

The learning in the Children's Realm will, I believe, foster a life-long love of learning. This will happen because the Children's Realm: 1. Allows freedom to explore and choose what interests or activities they engage in. 2. Provides a large number of opportunities, which outside of the Children's Realm might not be possible. 3. Creates an environment where there is no pressure, judgment, or evaluation that the children themselves impose. 4. Maintains a safe environment at all times for the children.

## CHAPTER 5

### PRECURSORS THAT SHOW MY IDEAS ARE WELL CONCEIVED

Although my own learning—as is also true for the learning I envisage in the Children’s Realm—emphasizes self-directed discovery, I have explored the work of others who came before me and been gratified to find support for my ideas from key figures and movements in education. In this chapter I mention some I feel especially noteworthy. As a work in progress, I am sure I have overlooked the works of others and would be grateful if these oversights would be pointed out by readers (email [deafduo@hotmail.com](mailto:deafduo@hotmail.com)).

#### Adventure Playgrounds.

Adventure Playgrounds (AP) came out in and around Europe in the 1940’s. The AP movement was to provide a creative play space or playground with raw materials that could be used in discovery and construction. Several studies were conducted and supported the AP movement against what was considered the fixed playground:

The main conclusion of our study is that most of the playgrounds found in Sweden today are designed so that they cannot be altered either by children or adults. They cater to mostly to play of a ‘repetitive’ nature and very rarely do them stimulate experimental and exploratory activities. (Noren-Bjorn 1982, 61)

Hayward, et al., quoted on the Fair Play for Children website (see <http://www.arunet.co.uk/fairplay/home.htm>), expresses the same conclusions, “...research has shown that children engage in a far greater variety of activities on adventure playgrounds and... is much more popular than” (Fair Play for Children 2001) typical fixed playground equipment. The supporters, who consisted of parents, teachers, and other professionals, felt that “children

need a chance to explore, to test, to create and to build and rebuild their world, freely and in their own way” (Fair play for Children, 2001). In order to accomplish this, the supporters would locate a piece of land with several acres or more and bring as many recyclables or raw materials they could find. From here they would allow children to build houses, buildings, cook over a fire, create a police force and start a government, among other things (Frost 1992, 277; Hogan 1974, 173). The resulting environment is both permissive and free, which is “especially attractive to children whose lives are otherwise much limited and restricted by lack of space and opportunity” (Frost 1992, 277).

One concern people have about AP is the potential for trouble. There is so much emphasis on the freedom of the children; one easily overlooks the supervision such an environment would require. Fair play for Children is a non-profit organization based in Europe that campaigns for the child’s right to play. Founded in 1972, around the height of the AP movement, it has a long history of advocating for AP, child protection, consulting children and problem intervention. Fair Play for Children advocates “no meaningless limitations or restrictions” (Fair Play for Children 2001), only to intervene to prevent injury, guidance, and support where needed. In fact:

The relationship between the playworker and individual children is of great importance: they must know when to help a child and when to withdrawl so that the child can work through a problem with or without assistance and this develop confidence through co-operation and self help. (Fair Play for Children 2001)

Such knowledge and skills will require a commitment to training staff so that these safeguards are not lost in the CR. Despite the amount of work that would need to be put into training, the rewards and benefits for children that can be gained cannot be overemphasized. The best description of the benefits inherent in AP and most closely resembling the CR is from Hayward, et al., quoted on the website of [Fair Play for Children](#), (Fair Play for Children 2001):

Advantages of adventure playgrounds include the tremendous diversity of available activities, the flexibility created by all the 'loose parts' in the environment, the sense of competence and responsibility instilled in children through being able to build and shape their own environment, and the skills that are learned in the process of building structures.

Problems with setting up and keeping up AP in America are similar to complaints received in the rest of the world. According to Patty Donald, coordinator of one of the only surviving AP in America, one major reason is people who do not have children and fear that the junkyard look will bring property values down make sure they close. Another reason is playground equipment manufacturers have a monopoly on the new plastic structures and are instrumental in pushing playground restrictions--the very restrictions that would prevent AP from forming (Patricia Donald, pers. comm. 5/10/01, [Pdonald@ci.berkeley.ca.us](mailto:Pdonald@ci.berkeley.ca.us)).

### John Dewey.

John Dewey's educational theories lend credence to both the environment the CR strives to create and the benefits inherent in the LSM. Although many of Dewey's educational theories were written focusing on the school as a social institution the same ideas apply to the CR as a learning environment, which is similar to, but different from a school. The CR as I have envisioned it above is much like a micro-society, complete with many of the physical and social structures found in the larger society. Dewey felt that allowing children to practice hands-on, current occupations, they would be better trained and exhibit the kind of thinking required of them when they were done with school, and according to Dewey, quoted in Guide to the Works of John Dewey (Boydston 1970, 270), '...to do this means to make each one of our schools an embryonic community life, active with types of occupations that reflect the life of the larger society.'

Dewey also recognized that to create this kind of environment in existing school structures, would require a lot of physical and administrative changes (272). “It requires... ‘movable furniture,’ ...laboratories, workshop space, the instruments for everything... [where] children can... work in groups or individually engage in active research” (272). The emphasis Dewey places on learning larger society occupations is not a direct objective, but rather an indirect result of manipulating and using the tools from which those occupations exist. He goes on to add:

[The] skill and information about materials, tools, and laws of energy are acquired while activities are carried on for their own sake. The fact that they are socially representative gives a quality to the skill and knowledge gained which makes them transferable to out of school situations. (Dewey 1916, 241)

Children will work better, learn more, and be happier when their “natural impulses” (228) are engaged. Further, to engage their natural impulses, we must create an environment that provides the materials, tools, and means of construction for intellectual expression (228-9). The tools themselves, just like the LSM kit are important materials as building blocks for these socially current, occupational tools. Dewey emphasizes that “only by starting with crude material and subjecting it to purposeful handling will [they] gain the intelligence embodied in the finished material (232).

A few other points of importance from Dewey are about play versus work, external pressure, and allowing mistakes to occur. The CR was designed specifically to address many of these ideas. Dewey felt both play and work are “equally free and intrinsically motivated” (241). Play will gradually become work as the “activities... grow more complicated [and] gain added meaning by greater attention to specific results achieved” (241). To keep the students natural interest, and hence motivation, there needs to be a limit of external pressure, deadlines, and other extrinsic pressures not directly bearing on the student. Otherwise, conditions will exist that are



“not intrinsically satisfying” (240), and become “means for avoiding some penalty, or for gaining some reward at its conclusion” (240). Finally, the “opportunity for making mistakes is an incidental requirement” (231). This, Dewey contends, is not because we desire mistakes, but:

Overzeal to select material and appliances which forbid a chance for mistakes to occur, restricts initiative, reduces judgment to a minimum, and compels the use of methods which are so remote from the complex situations of life that the power gained is of little availability. (231)

### Peer to Peer Relationships.

Peer to peer relationships represent working or playing between children--not teachers or staff. In Children Helping Children, Foot summarizes the works of several researchers into these relationships as falling into three types. These approaches are peer tutoring, peer collaboration, and cooperative learning. (Foot et al. 1990, 8) Hereon page numbers refer to (Foot et al. 1990).

Recognition by educators, researchers, and psychologists that children are much more capable than they have been given credit for in the last century (6) should be the driving force of change to address this new perception. However, “Many teachers are... suspicious... of any peer-based teaching technique, and are not likely to be... convinced to adopt a method which they believe might undermine their... position or profession” (7).

There are a couple characteristics important to peer tutoring. First, it is usually one child teaching another child of the same or different age (9). Second, there needs to be an “asymmetry in the knowledge or skill between them” (9) such that “the more capable or knowledgeable children push the less capable or knowledgeable...” (10) children in the area of their cooperation.

The second area of cooperation between children is peer collaboration. This differs from peer tutoring in that there is relatively no asymmetry in the tasks or area of knowledge between

them, and there can be more than two children in this group (10). “Collaborative learning experiences are ones in which participants discover solutions and create knowledge together by sharing, discussing, and challenging their own partial and incomplete perspectives on a problem” (10).

Finally, cooperative learning that is also known as small group or team learning is the third peer relationship. Here teachers can take advantage of the way larger, more complex problems are broken down in order to give each group a task or part of the problem to be solved. When each group is done, then the information produced by each group can be pooled into addressing the larger problem as a whole (11). Like collaborative learning, it represents a relatively symmetrical knowledge among the children, and seen “as an extension or development of the peer collaboration rather than a distinctly different technique” (10).

As I mentioned above in the Adventure Playgrounds section, facilitators and staff in the Children’s Realm will be trained to know when to get involved and when to stay out of progress being made by the children. As the CR is child-based, and the majority of the projects being done in it will depend on peer-to-peer relationships, knowledge of these different types of cooperation and the benefits to be gained from them is indispensable. Children themselves can take turns testing themselves in the different roles or work on a project alone. It will be up to them and provide a comfortable foundation for the same kinds of cooperation outside the CR as well.

### Problem Solving Pedagogies.

Most problem solving strategies use a step-by-step plan or system to solve problems. Although they differ from approach to approach, most use some variation of five core steps: “define the problem, explore alternative approaches, determine criteria for evaluation, select the

solution, develop an action plan” (Greenwood 1996, 1). While these may be good for general problem solving, rarely does anyone tackle problems using these strategies in everyday life. We become expert problem solvers by being confronted with daily problems that need to be taken care of, i.e. finding out what is wrong with your car, how to landscape your yard to a desired effect, or picking stocks to invest in this fall. While some problem solving strategies are effective on some problems, they are not on others. Because of this, teachers have a large range of possible strategies to use inside and out of the classroom as children are exposed to, and subsequently required to solve, a variety of everyday problems.

While there are many good problem solving strategies, and more being developed all the time, it would be beyond the scope of this paper to elaborate on the number that may find their way into the CR. Instead, I would like to emphasize a few which, I feel are particularly relevant to the environment I strive to create, and where I feel children can most benefit. The first of these is problem-posing. “Problems do not come pre-posed to scientists... students can only begin to appreciate the tremendous agenda-setting issues in problem-posing if they are encouraged to pose problems themselves” (Peterson and Jungck 1988, 4). There are several other similar strategies, of which problem-based learning is particularly noteworthy. Problem-based learning provides problems that are not very clear or ‘fuzzy’ and need clarification (Burruss 1999, 46-49).

Project-based learning brings children together around a project of which, ideally, they will have an intrinsic interest. Project-based “curriculum emphasize[s] open-enquiry learning environments, solving problems in ill-defined contexts, and cooperative learning” (Lewis et al. 1998, 4). Opposed to typical learning tasks, “a project typically involves more complex cognitive processing which can serve as a catalyst for greater learning” (Guzdial 1998, 1).

In their work, Designing Everyday Things (1994), Helen Clayfield and Robyn Hyatt developed the “Technological Process”, which is about teaching problem solving processes that emphasizes designing and working hands-on with a variety of materials. Teaching technology can provide students with the ability to design and test their ideas, “explore a wide variety of materials” (3) and “provides an insight into social, cultural and historical implications of technological change” (3).

It doesn't matter which of the several worthy methods students use to solve problems as long as the problems have some personal significance or connection to them, and it allows them to test their own solutions. The children will be “eager to demonstrate their knowledge by constructing a model, creating a skit, or designing a picture to illustrate the final solution” (Greenwood 1996, 2).

Children in the CR will be supervised, engaged, encouraged, and coached. There will be the same kinds of problems found in any other child-centered environment that will require the intervention of trained staff and facilitators. The AP movement started what is a crude resemblance of the CR by advocating for unrestricted access to materials and supplies on playgrounds. By training staff and volunteers on appropriate intervention, they have managed to create a unique and intellectually free environment for children to discover. Dewey pushes us to engage the “whole pupil” by fostering their “natural impulse” to manipulate tools and materials, and construct. He also advocates for the ability to transfer skills to the larger society, to play and work free of external pressure, and to make mistakes. Children working with children will provide several possible relationships for growth and support. Among these is peer tutoring, Peer collaboration, and peer cooperation. Finally, several problem solving practices most closely resemble the environment I strive to create; they are problem-posing, problem-based learning,

project-based learning, and the technological process. The CR is designed not only to support all of these great ideas--it is based on them.

## CHAPTER 6

### IMPLEMENTING A CHILDREN'S REALM

#### Steps in Implementing a Children's Realm.

The Children's Realm, like any 'real' city, does not pop up overnight. Buying the land, manufacturing the LSM, and establishing a site would all be prohibitively expensive to do as a first step. Even if we did have all the funds necessary for full implementation, we would not be able to build anything because we are not the builders- the children are. It will take the CR staff and children a lot of time to interact, to test new ideas, and to play an active role in the development of a Children's Realm. The Children's Realm has to evolve. A city or anything even resembling one would take a long time to be realized. As such, a Children's Realm would start from scratch with just a prototype LSM building kit and a host of everyday utilities for experimentation and use. The kit should be big enough to build a house, a crane, a forty-foot long free span bridge, and other structures of similar nature (just one of these at a time will go a long way in convincing others). The kit needs to begin impressively such that both adults and children alike can appreciate the LSM structures enough to know how much of an impact a much larger version would have. At the same time, for logistical reasons, it needs to be small enough to transport to a school gym, field, or place of activity in a large truck.

The LSM kit is still in development at this time, and will require funds to complete its design. Since there are many angles of expertise involved in the engineering, materials, design, and production of such equipment, putting the finishing touches on a prototype LSM will be the work of a team of specialists. Some of these specialists might include:

1. Structural Engineer
2. Materials Specialist
3. Mechanical Engineer
4. Industrial Design Specialist
5. Manufacturing specialist
6. Child Safety expert
7. Electrical Engineer
8. Materials handling specialist

These experts are to make sure the design meets safety, structural, and feasibility requirements. To make sure that the LSM meets the flexibility requirements of the Children's Realm and to find the best potential standard for connecting the pieces. These experts will also need to be represented on the board of the Children's Realm to insure the LSM is kept up to date within all the required fields or domains or codes.

In order for this experiment to be conducted successfully, four things will need to be included in an initial funding proposal. First, the funds to hire the necessary consulting specialists to complete the prototype LSM design. Second, the funds necessary to buy the materials and manufacture the prototype LSM. Finally, to convince future sponsors, we need an appropriate evaluation program to evaluate the LSM both before it is approved for use by children, and while children are using it.

Evaluating the prototype is important before the children use it in case there are any defects or potential safety concerns that need to be addressed before the children begin using it. If there are, it goes back to the design team for a fix. If not, it goes into use with schools or other programs for the secondary evaluation, where it is evaluated by specialists, educators, parents, and the children working with it. If it does not pass this stage, it once again goes back to the design team for trouble shooting. If it works well, then more proposals for funds can be written up and a larger scale program reaching more children can be secured. Ideally, initial funds

should cover costs associated with running this evaluation stage for at least a year, providing plenty of time to secure secondary funding. See Appendix A for an example of proposed initial funding needs.

### Initial Programs for the Prototype LSM.

Initial programs are those that take advantage of the reusability and hence the portability of the LSM. By taking a large enough LSM kit to schools, corporations, and other events, it will serve to, 1. Convince others of the impact the LSM provides as a teaching tool. 2. To provide a small glimpse of the potential a Children's Realm would have. 3. Evaluate and make changes to improve the LSM before it is manufactured on a larger scale. 4. Provide a means of fostering appropriate feedback from colleagues and collaborators watching the children interact with the LSM. 5. Begin teaching teachers, facilitators, and other staff the appropriate interventions and training.

What would be built? Ideally, it would be good to have a lot of general utilities with this kit. These can be used to build either alone or in combination a host of typical applications such as the utilities for a house, a car, a crane, or even a drawbridge, etc. I can give the hosting institution a number of different possibilities to choose from and then customize the project to their needs. For example, if a corporate party wants a challenge for their staff party, I can customize something that will fit their needs, i.e. a drawbridge with two teams on opposite 'islands' and the challenge would be for them to connect and switch places without going into the 'water' or surrounding areas. While this might sound much like a typical discovery type of activity--none of them ever did it by actually building a 40-foot drawbridge!

As another example, supposed a school physics class is working on pulleys. I can customize a crane LSM kit that would allow them to adjust different pulleys until they can hoist



a large heavy object. Ideally, the professors' car would be a physics lesson these children will not forget for a long time to come (so will the professor if it does not work!) While this may be a little far fetched (unless she/he drives a Yugo) a practical but big impact with this small LSM kit is not. An example of evaluation with this same scenario is if the codes give them the proper number and strength of pieces to lift the car and it does not work--that is a problem that would need to be fixed or reengineered.

A CR cannot be simply set-up and run. It has to evolve. First we would seek funding to provide the means of hiring appropriate experts. The experts will bring the LSM from conception to an appropriate prototype. By providing the LSM on a limited scale to schools, corporations, and other interested parties; we can evaluate its performance as it was intended, make any revisions that are deemed necessary, train teachers and staff the appropriate intervention, and foster support for the larger CR undertaking. Concurrently collaborating with others and seeking the start up funding necessary to implement the CR is ongoing. Successful completion of this second stage will hopefully make implementing the children's realm a possibility.

## CHAPTER 7

### EPILOGUE

Writing this paper has been a very frustrating and trying experience for me. It must have also been a very frustrating experience for my readers and others working with me on this paper. For all that trouble I owe both myself and others an apology- it took me all these trials and tribulations to realize why this happened this way. I have spent what I feel is a great amount of time trying to write about an idea I have in order to gain their support and convince them of the merits. I have a very clear, singular vision, and apparently a similarly singular approach to my work. To this end, I have not benefited from working alongside others who could have helped ease this process, and as a result, my work is left at the point where it is—in dire need of the expertise of others to further it.

I could have benefited from working more closely with readers and colleagues in how these ideas are written. My strengths are purely kinesthetic and my focus was on the actual physical LSM. As such, I felt I ended up in a kind of “cacth-22”. I felt I needed an actual working prototype to explain my ideas and how they would be used. Each time I attempted to explain these ideas on paper alone, there were misunderstandings which reflected a lack of understanding of my idea. I knew that if I could show an actual prototype and readers saw how I was using it, they would understand what I was trying to do and they would then be in a position to help me better articulate my paper. Therein lies the problem—I need the prototype to get help writing the paper, and the paper to get help funding and creating the prototype. Other suggestions for what happens later in the actual Children’s Realm, or in terms of future

evaluation seemed premature prior to creating the prototype itself. I also felt I needed a strong paper to convince those might fund it to donate and thus make the prototype possible. I felt I landed somewhere in between on both writing a convincing paper, and creating a working prototype.

In the end, this is the real lesson I have learned for myself and about myself. I am grateful to have had this opportunity, and will move forward with this work once I am able to find, and convince future teammates.

## APPENDIX

### Pictures of LSM Prototype

Picture 1



This picture represents a small-scale LSM prototype I have been working on. It is smaller than the LSM which is envisioned in this paper. This LSM prototype reflects the budget, time, and resources I am limited to. As a work in progress, I hope to increase both the scale and scope of what you see above.

Picture 2



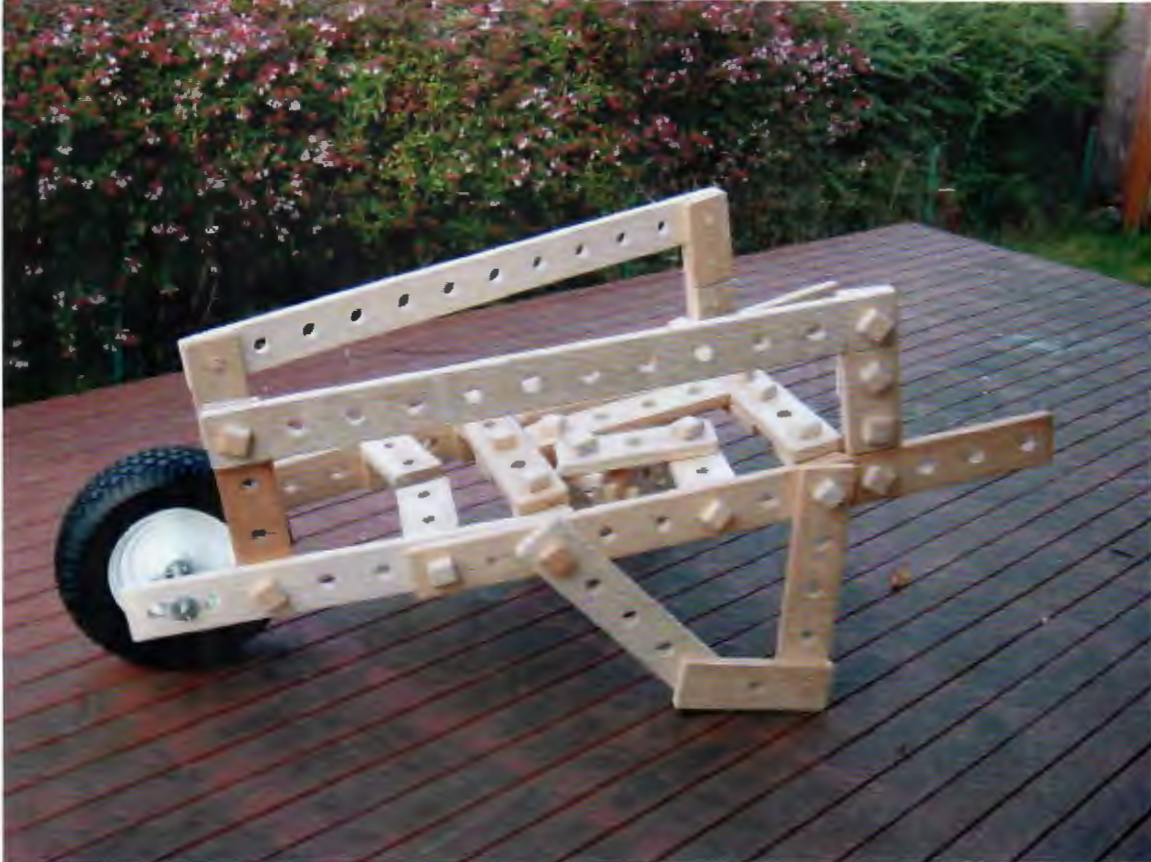
This picture shows specific parts from the above “basic kit” taken out to put together a specific utility. Here I needed a wheel barrow to move some heavy boxes around the yard. I did some experiments to design and build a wheel barrow with what I had in the basic kit first, and then show those parts here, unassembled.

Picture 3



This picture shows what assembly of a product out of the LSM might look like. Here I am putting together the wheel barrow.

Picture 4



This picture shows the wheel barrow when it is completely assembled. Another person might have a completely different idea, design, or way doing this. This will depend on the person's amount of time, amount of LSM parts, creativity, and specific needs. This worked well for my purposes.

Picture 5



This picture shows what happens when I finish the product. I can use it! This design might not work well, but then I can always go back and make it better-which is what the LSM is all about. This design worked fine for my needs here, but probably not for the car I want to drive around the block. The goal of further research and experimentation with LSM will make that and much more possible.



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