

EMPIRICAL ANALYSIS OF BEHAVIOR IN ARCHITECTURAL SETTINGS

Principal Investigator: Laura Brunik
Graduate Student at NDSU
(North Dakota State University)
Laura.Brunik@my.ndsu.edu
511 140th Ave NE
Ham Lake, MN 55304

USING DARTFISH AND JMP SOFTWARE TO MEASURE MOVEMENT

EMPIRICAL ANALYSIS OF BEHAVIOR IN ARCHITECTURAL SETTINGS: USING DARTFISH AND JMP SOFTWARE TO MEASURE MOVEMENT

“Architecture can get people talking. It can calm children in the classroom, make passive people more active, and shape corporate culture. It can also encourage people to find new paths and discover new aspects of their city—and of themselves.”

Kim Herforth Nielsen

Understanding whether the mere sight of architecture can create behavioral responses or not is critical to an architect. If an architect knows what intentional response they want from the inhabitants of their design, then they could decide from a variety of design options depending on the sensory responses for each type of space. The strategy to finding out if architecture can influence behavior is to assess how the users actually respond and behave in particular environments. Sensory responses generally involve color, odor, illumination, vibration, etc. and are usually learned responses based on culture. In this context, the philosophical framework for research is simply empirical. The research analysis is done to determine if there is a relationship between space and how it may influence a person’s energy and activity level. Studying children in their childcare center is a good proposition because children are still adapting to culture and we can get to the root of behavioral responses. Eventually the information found will be used in a thesis as a tool to evaluate whether architecture can assist in a multi purpose health and wellness living center. This center will promote spiritual wellness as well as losing weight and maintaining health.

INTRODUCTION

Can people interact and communicate with architecture? Understanding the context of a building and the people who inhabit the structure may offer up a dialogue that generally persists long after the entire construction is finalized. This is why designing with intention is important. Investigating a site and asking questions about the inhabitants of the site, architects can find the narrative the building should tell. Architecture is story telling, and the story becomes a progressive concept. Architecture, can in fact, shape the world, if we can make it shape behavior.

Obesity as a research motivation

Obesity is the last socially acceptable form of discrimination. Obese people, with personal experiences, have said that they feel invisible; people do not look them in the eye the same way they would with a thin person, and professional colleagues, in most instances, do not take them as seriously. This in turn becomes an emotional battle. Food indulgence is perpetual and becomes uncontrollable as life confronts them with daily conflict. Slowly, the weight will gain and the disorder often becomes invisible to the over eater.

It is important to recognize this because obese parents are more likely to have obese children. Children are very responsive to the lifestyles and habits of their parents. Children will follow the same dietary and exercise habits of their parents and if they make poor lifestyle choices it encourages their children to follow the same attitudes and behaviors. These behaviors lead to obesity as children that will stay with them into adulthood and will eventually run another vicious cycle.

It is important to address obesity, as family matters so that both the adult and child are not devaluing the importance of a healthy, active lifestyle. Evaluating children in their environments will help adults, especially family members, to address problems that contribute to obesity.

The main treatment for obesity consists of dieting and physical exercise. Diet programs may produce weight loss over the short term, but maintaining this weight loss is frequently difficult and often requires making exercise and a lower calorie diet a permanent part of a person's lifestyle. A combination of dieting and exercise appears to work better than either one alone. Success rates of long-term weight loss maintenance with lifestyle changes are low ranging from 2–20%. Collaborating support from family and friends will be essential in a weight reduction program. It is important to establish a nutritious routine that feeds one often so hunger is not a haunting program. Most people don't realize that even modest weight loss improves your

health. Dropping pounds slowly and steadily will increase your chances of keeping the weight off. Lifelong commitments therefore require time, effort, and patience. Reminding yourself about your positive process is also an essential key to mental success.

Exercise is a major mood lifter, a great way to burn energy, and a way to strengthen your bones. Furthermore, it redirects and diminishes stress, fills wasted time, and replaces craving and relieves the overwhelming guilt of abuse, neglect and domination by food. Exercise is also a great tool for managing high blood pressure, heart disease, or diabetes. Exercise works to raise the metabolism as muscles grow, then calories burn and fat diminishes. Hearty activity also increases the power of your heart and lungs. Backed with a good diet, exercise consistently corrects a hormonal system that eccentric.

With managing obese children, they need to have a thorough medical evaluation by a pediatrician or family physician to consider the possibility of a physical cause. In the absence of a physical disorder, the only way to lose weight is to reduce the number of calories being eaten and to increase the child or adolescent's level of physical activity. Lasting weight loss can only occur when there is self-motivation. Since obesity often affects more than one family member, making healthy eating and regular exercise a family activity can improve the chances of successful weight control for the child or adolescent.

Exercise in general should be performed daily, and should not be forced upon someone. Architecture should therefore impact it's inhabitants to help them be motivated to be and stay active, reducing the problems that contribute to, and follow from, obesity.

Children have many options for staying healthy, they should avoid a stationary lifestyle by increasing their activity level, perform aerobic exercise for at least 30 minutes a day, three times a week, increase their physical activity simply by walking, climbing stairs instead of using an elevator or escalator, ect. Children may also talk to their health care provider before starting an exercise program and they should embrace the delight of fulfillment and the thrill of success.

Contributing to wellness

Wellness is generally used to mean a healthy balance of the mind, body and spirit that results in an overall feeling of well being (wikipedia). This is different than the term for healthy which is a state of this well being free from disease (princeton). Wellness has been defined by the Wisconsin-based National Wellness Institute as an active process of becoming aware of and making choices toward a more successful existence. This is consistent with a shift in focus away from illness in viewing human health, typical of contexts where the term wellness is used. In other words, wellness is a view of health that emphasizes the state of the entire being and its ongoing development.

Wellness can also be described as “the constant, conscious pursuit of living life to its fullest potential.”

“We are all a little off-balance in that we are not perfect. And not all that appears to be misbehavior is misbehavior or needs analysis -- Nothing work, planning, discipline and healthy pride can't fix.”
-Dave Draper

Architecture and Environmental Psychology

Environmental psychology is an interdisciplinary field focused on the interplay between humans and their surroundings. The field defines the term environment broadly, encompassing natural environments, social settings, built environments, learning environments, and informational environments. Since the beginning of environmental psychology, the field has been committed to prioritizing research aiming to solve complex environmental problems in the pursuit of individual well being with a larger society. When solving problems with a human-environment interaction, a model must be use to predict the environmental conditions that a human will behave in a decent and creative manner. This model provides assistance in designing, managing and protecting to restore environments that enhance reasonable behavior and predict outcomes. The research inherently explores complex settings such as the effect of environmental stress on human performance, the characteristics of restorative environments, human information processing, and the promotion of durable conservation behavior. Geographers, economists, geographers, policy-makers, sociologists, anthropologists, educators, and product developers all have discovered and participated in this field. Although “environmental psychology” is arguably the best-known and most comprehensive description of the field, it is also known as human factors science, cognitive ergonomics, environmental social sciences, architectural psychology, socio-architecture, ecological psychology, eco-psychology, behavioral geography, environment-behavior studies, person-environment studies, environmental sociology, social ecology, and environmental design research. It is the link between the person and the built environment.

BACKGROUND INFORMATION

The Greeks were the first to recognize obesity as a medical disorder. Hippocrates wrote “Corpulence is not only a disease itself, but the harbinger of others”. The Indian surgeon Sushruta (6th century BCE) related obesity to diabetes and heart disorders. He recommended physical work to help cure it and its side effects. In the 1950s, increasing wealth in the developed world decreased child mortality, but as body weight increased heart and kidney disease became more common. During this time period insurance companies realized the connection between weight and life expectancy, and increased premiums for the obese.

Many cultures throughout history have viewed obesity as the result of a character flaw. The obese or fat character in Greek comedy was a glutton and figure of mockery. During Christian times food was viewed as a gateway to the sins of sloth and lust. In modern Western culture, excess weight is often regarded as unattractive, and obesity is commonly associated with various negative stereotypes. People of all ages can face social stigmatization, and may be targeted by bullies or shunned by their peers. Obesity is once again a reason for discrimination.

The problem of childhood obesity in the United States has grown considerably in recent years. Between 16 and 33 percent of children and adolescents are obese. Obesity is among the easiest medical conditions to recognize but most difficult to treat. Unhealthy weight gain due to poor diet and lack of exercise is responsible for over 300,000 deaths each year. The annual cost to society for obesity is estimated at nearly \$100 billion. Overweight children are much more likely to become overweight adults unless they adopt and maintain healthier patterns of eating and exercise.

Evolutionary Factors

During the course of human evolution, intermittent food shortages and an active lifestyle would have been the norm. People, who did not have the genetic trait to allow for fat accumulation, were better suited to survive. People who did not have the ability to store fat or have the chance to eat more than what was needed for day to day metabolism, typically died during these food shortages and long winters. Therefore, the people who died did not pass on their genetics to the next generation. Conversely, our ancestors who were able to eat more than what was needed for day to day needs grew fat and *did* survive periods of food shortage, passing the genetic trait for obesity on to the subsequent surviving generations. This is why, a today human, having survived the many generations of previous ancestors, indeed have a genetic predisposition for obesity.

Architecture and Environmental Psychology

The origins of this field of study are unknown, however, Willy Hellpach is said to be the first to mention “Environmental Psychology”. One of his books, *Geopsyché* discusses topics such as how the sun and the moon affect human activity, the impact of extreme environments, and the effects of color and form.

The end of World War II brought about a higher demand for developments in the field of social psychology particularly in the areas of attitude change, small-group processes, and intergroup conflict. This demand caused psychologists to begin applying social psychology theories to a number of social issues such as prejudice, war, and peace. It was thought that if these problems were addressed, underlying notions and principles would surface.

Although this time period was crucial to the development of the field, the methodologies used to carry out the studies were questionable. At the time, studies were being conducted in a laboratory setting, which caused some doubt as to their validity in the real world. Consequently, environmental psychologists began to conduct studies outside of the laboratory, enabling the field to continue to progress. Today environmental psychology is being applied to many different areas such as architecture and design, TV programs, and advertisements.

The earliest noteworthy discoveries in the field of environmental psychology can be dated back to Roger Barker who created the field of ecological psychology. Founding his research station in Oskaloosa, Kansas in 1947, his field observations expanded into the theory that social settings influence behavior. Empirical data gathered in Oskaloosa from 1947 to 1972 helped him develop the concept of the “behavior setting” to help explain the relationship between the individual and the immediate environment. This was further explored in his work with Paul Gump in the book *Big School, Small School: High School Size and Student Behavior*. One of the first insightful explanations on why groups tend to be less satisfying for their members as they increase in size, their studies illustrated that large schools had a similar number of behavior settings to that of small schools. This resulted in the students’ ability to presume many different roles in small schools (e.g. be in the school band and the school football team) but in larger schools there was a propensity to deliberate over their social choices. Barker preferred fieldwork and direct observation rather than controlled experiments. Some of the minute-by-minute observations of Kansan children from morning to night, jotted down by young and maternal graduate students, may be the most intimate and poignant documents in social science. Barker spent his career expanding on what he called ecological psychology, identifying these behavior settings, and publishing accounts such as *One Boy’s Day* (1952) and *Midwest and Its Children* (1955.)

Dartfish History

Dartfish started in 1999 when it was known as VideoFinish™ (now known as SimulCam™). This small start-up, eventually became well known in 2001 for its innovative digital image enhancements in the sports broadcast world. Dartfish is now recognized for its breakthrough in training applications for sports, education, healthcare, and more. It is cutting-edge for sports training and has become very popular with its Internet content. The Dartfish mission is “By providing cutting-edge video and enrichment functionalities in easy-to-use applications, Dartfish makes the power of video accessible and sets the de facto video standard across industries like sports, education, healthcare and new media.”

NDSU Center for Child Development

According to the NDSU website, the Center for Child Development is operated as an education and research facility for the Department of Child Development and Family Science in the NDSU College of Human Development and Education, and as a service to NDSU faculty and staff. The Center is licensed by the North Dakota Department of Human Services and is accredited by the National Association for the Education of Young Children. This association “recognizes high-quality early childhood programs that provide a safe and nurturing environment, while promoting the physical, social, emotional and intellectual development of young children.”

The Center for Child Development’s philosophy is “...that children learn in an environment that supports their success while being respectful of each child’s learning style. The environment provides opportunities for language acquisition and fosters the development of trust so children feel safe and encouraged to explore, discover and play. Teachers listen to children, encourage independence, self-control develop teaching strategies to promote positive outcomes for all children. Parent involvement is always welcome in the center to promote a strong home-center partnership. This valued partnership provides continuity of care and education for each child.”

OBJECTIVES

The purpose of the research is to collect data about subjects using a space, and analyze the data to see if architectural space affects their activity level. The subjects in this context are preschool children from the NDSU childcare center. Several reasons for choosing to study children are that children are not influenced by the cultural connotations of colors and how they make you feel, children are small in size so a whole building does not need to be constructed to test their reactions, and children in day care facilities are easy to observe. They have "freedom for activity." Getting to the root of humans' initial responses of activity levels, in different spaces, under different conditions is essential.

The desirable outcome is to eventually be able to determine what types of physical environments will help us, unconsciously, lead to more efficient and healthier lives.

DISCUSSION OF PROCEDURE

The tactics that are necessary to measure the behavior based on activity levels is to evaluate the amount of movement of each individual, more specifically, the distance in movement, and the frequency. There are many reasons why a person may be energetic so to keep the research controlled, consistency in the daily activities is crucial, as well as analyzing the recordings daily to find the average amount of movement within each study. With the help of Dartfish software, analyzing recorded videos, and then evaluating the distances moved by each object in the video will be effortless. Dartfish allows the user to pick multiple synchronization points and to follow them throughout a time frame. This will allow each individual to be followed in the video analysis for measuring the distances traveled.

The strategy in finding out if architecture can influence behavior is to assess how the users actually respond and behave in particular environments. Studying the presence or absence of distraction within a space, lighting levels, number of subjects in the space, temperature of the space, sound levels in the space, and how it will affect behavior are such main factors. The analysis begins with only a few small variables, so that the correct skills will develop with the scientific process and new technologies. During the first week open spaces versus enclosed spaces (measured by amount of objects in the space) are studied. Then during a certain time of the day, such as playtime, a camera is set up to record the activity in the space, then the findings are reviewed on the computer program to mark the distances each subject traveled. Video data will be recorded everyday for a week. The computer program helps to analyze the subjects in the room and record the distance each one traveled. After all the data is analyzed the average distance traveled for that particular variable is found. During the second week the choice to study different lighting levels are measured with a light meter. The same playtime and camera is set up, and the same data gathering procedure is followed. During the third weeks the same study is followed with different temperatures in the room, measured with a temperature gage. The children are not moved from their original environments. The observation rooms in the day care facility are used, so that the children still have a normal day within their childcare center.

Participants in this study are minors (preschool age 3-6), and the project is conducted in class, with about no more than 20 or 30 subjects. The participants and their parents are contacted by e-mail, print outs or personally contacted by Laura Brunik or their supervisor. With the subjects being minors, parent/guardian consent forms are sent out to each individual. If they chose not to participate they are sent in a separate room, as they go about their daily activities. The research does not interrupt educational activities.

The parents sign a consent form placed by the supervisor of the day care facility in each child's mailbox. The parents receive this when they pick their child up from day care, and then drop it off in a yellow envelope outside the door.

The research does not include potential risks. However, adjusting temperature levels possibly contribute to sicknesses. Therefore, temperatures are consistently in the range of 68 to 74 degrees Fahrenheit, because according to the X-Cel home energy (http://www.xcelenergy.com/SiteCollectionDocuments/docs/60_Ways.pdf) these temperatures are recommended for comfortable living (along with saving energy). It is also a ND licensing requirement. The only discomfort that the research arises is the fact that video recording is used for the analysis. The daycare supervisors enforce normal safety procedures to ensure that the risks stay no more than minimal, and correct emergency and safety response procedures are always taken as normal (the same as NDSU enforces).

All information collected is kept private. Video recordings of children interacting in their environment are collected for analysis by the research team. The child/legal ward is referred to by a code (such as Child A, B, C, etc). Names are not stored in data files and never appear in any report about the study. Information is not shared with the children, the teacher, or any other school personnel. NDSU and the principal investigator own data and records created by the project. Video recording, is necessary to measure the distance a child travels during playtime or certain other activities during the day. After the data the is analyzed, graphs with subjects A,B,C, Etc show the distance that each subject traveled. The video is only used to collect data on the distance each subject travelled. The data is stored on a personal computer and deleted once the data has been analyzed, it also has password authentication. There is no sensitive data, but in the case of unanticipated abuse caught on camera, obligation to report it would be done.

Calendar of Events

(Subjected to possibly change)

Lighting Levels

First 5 days: Artificial Lighting/ No natural Light

6-10 days: Natural Lighting

Sound Levels (no lyrics are used)

11-15 days: classical music/relaxing music

16-20 days: Band/rhythm and beat

Types of Spaces

21-25 days: Open Spaces (More space than toys) vs. Smaller Spaces (More toys than space)

In this particular area of study the children are not limited to their toys. The spaces will be set up this way and we will see how the children react to each space. Although it is not encouraged, they may move toys around and it will be noted as a factor in the study. There are also two cameras (from different angles) studying each space. The same childcare procedures run as normal.

Temperature of Spaces (this is only to be studied with extra time)

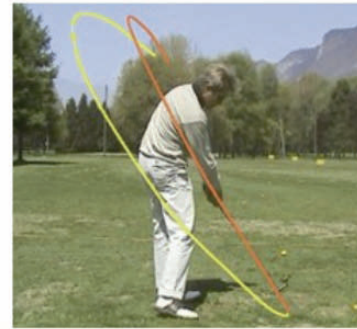
26-30 days: Temperature set to 68 (no cooler)

31-35 days: Temperature set to 74 (no warmer)

Note: This study is organized in days instead of weeks in case of absence of the researcher or initial start date not corresponding with the first day of the week.

Software & Equipment

- Dartfish
- Camera
- Tripod
- Computer system requirements
- Microsoft excel
- JMP
- Multi-use meter (for light, sound, etc.)



The first thing to consider before using the software is to make sure all the equipment is correct. A camera is the most essential, followed by a tripod, and external device to hold video files. It is also important to make sure that the computer meets all the requirements for the software.

In order to see how far a subject or point in a video has traveled, Dartfish follows certain pixels through the video frames. It also calculates the distance based on a reference point. A reference point must be used in the video recording as well as a steady camera. Dartfish is able to graph the distances and import the information into an excel format, and then into visual graphs with the JMP software.

The following information is provided by Dartfish, Chapter 5, *Analyzing Performance*

To load clips into an analysis

1. Activate a vacant video display screen A, B, C or D in *Single-screen* mode or display the required number video display screens in *Split-screen* mode.
2. Double click each clip in the *Items List* of the *Tray* of the *Library*
3. You can also drag & drop a clip onto any video display screen. This offers greater flexibility over which video display is used. This method can be used to replace a previously loaded clip.

Playing clips

Once a clip is loaded you have the ability to control the playback (play/pause, stop, frame-by-frame, etc.). This can be done by using the playback controls buttons and the timeline underneath the video screen.

Drawing on the video

The Analyzer allows you to draw shapes and add text on top of a clip's images. Use qualitative drawings (e.g. lines, circles, rectangles, etc.) to highlight details. Quantitative tools (angles, measurements, etc.) can be used to extract statistics from the video.

To add a drawing

1. Display the frame of video to which you wish to add shapes and/or text. To do this, you can drag the play head and use the frame-by-frame buttons.
2. Select a drawing tool

3. Position the mouse cursor on the image at the point where you want to start drawing
4. Left click, hold and move the mouse to the end point
5. Release the mouse button

To measure distances, proceed as follows:

1. Right-click on the *Time* button and select *Distance* from the context menu.
2. Click, hold and move the mouse cursor to draw the reference distance (the one with the dashed line)
3. Right-click on the reference distance and select *set as reference...* from the context menu.
4. Enter the size of the reference object.
5. Select the *Distance* tool again and draw the distance. It will be computed based on the line length and reference value.

To activate the automatic tracking

1. Position the play head at the beginning of the performance
2. Draw a shape on the video
3. Right-click on the shape and select *Tracking* in the context menu
4. Select the object speed from the context submenu (this defines how far from the last position Dartfish will search the video image for similarly colored/shaped objects).
5. Click the image to deselect the object.

Using the automatic tracking

To start tracking, simply play the video. The drawing color changes to green indicating that Dartfish has started to track the object. At any moment, you can pause playing;

- If you observe that the tracking is “lost” (e.g. when the object gets occluded). In this case, manually reposition the drawing onto the tracked object and continue playing.
- If the object disappears from the field of view. In this case, right-click on the drawing and select *Suspend Tracking* from the context menu. Dartfish stops tracking from this position (the drawing color changes to red.)

Using the data table

The *Data Table* drawing tool enables you to collect time-dependent data related to the action in your video. For example, at different time instances you can manually enter the distance an athlete has run so far, just as you would in an Excel spreadsheet. Then, the data table tool can compute (and display) automatically the average overall speed of the interval speed of the athlete. It is also possible to link another drawing tool such as an angle or a measuring tool to a column of a data table, to display and store the evolution of the corresponding quantity (angle/length) over time.

1. Hold ctrl and select your track drawing and reference point. Right-click and select second drawing follows first.
2. Then ctrl select the data table.

FINDINGS

Multiple Variables were formulated early in the process and were an issue for certain parents. Choosing to eliminate variables and concentrating on just one was the solution. Therefore, the research continued by studying only natural light versus artificial light.

Lighting Levels

First 5 days: Natural Lighting

6-10 days: Artificial Lighting/ No natural Light

Many lessons were learned throughout the research process.

1. Determine how the software operates before explaining your research, there may be factors in the research that the software requires.
2. Making sure the childcare department was up to date with all preparations.
3. Communication should be well established with the childcare department because their suggestions may be important to your research process. This should be done BEFORE the IRB protocol is submitted.
4. If you submit the IRB protocol first then you must go through the process over again if there are any changes, and there will be changes if the childcare department isn't parallel to your research material.
5. Time may be essential in this research and submitting the IRB protocol multiple times may set you back.
6. Studying the software is also important. Dartfish showed that a camera must not be moved and a reference point is needed.

7. Giving permission slips to parents should be done at the beginning of the week and due the day before the last. This allows the parents an extra day if they have forgotten. Also, make extra copies.
8. The most important thing to remember, unfortunately, is that even though you gave the parents an extra day, you should expect up to a week for late slips.

Some observations were made with the study. Flaws in the set up were discovered. Dartfish does not calculate depth for distance, and there was no control for keeping the children in their space for the same amount of time every day. Other observations were that the children might have been more active or drawn to the space if there were others around them. The speed at which they traveled was also a factor, and the xcel files should that the average speed at which they traveled was greater in the variable of natural lighting.

RESULTS

Overall, over 35 videos were collected, converted, combined, and analyzed, producing over 53 excels spreadsheets that were also, combined and analyzed and as a research journey the results are currently inconclusive. With a great deal of trial and error and new technical equipment to learn and experiment with, time was a fragile device. For each hour and a half of video recorded, there were 2 hours to analyze and record the data. Then this process is repeated for each individual kid in each video. The timeline only allowed for one child to be analyzed, therefore, there are only results for subject A below.

Results For Artificial Light

Subject A	Time (s)	Distance (m)
DAY 1	63984994.9	1208.1182
DAY 2	110011229	1846.424
DAY 3	202593675	3485.8599
DAY 4	185943.98	77.805
DAY 5	392041880	6755.5961
WEEK TOTAL	768817724	13373.8032

or 4,077.37 ft

Results For Natural Light

Subject A	Time (s)	Distance (m)
DAY 1	8606278.86	152.4101
DAY 2	38520482.3	647.6783
DAY 3	31191179.4	817.2193
DAY 4	33791996.1	1130.3845
DAY 5	204067882	6300.4078
WEEK TOTAL	297719489	8468.5999

or 2,581.70732 ft¹²

CONCLUSION

The results for distance traveled are greater in child A with artificial light, however this is not be accurate because the time measured that we was in the space was more than the natural light. The research would draw better results if the recordings were done in plan view instead of a perspective, this would eliminating the problem with estimating the distance in depth in the Dartfish software. Results would also improve if the time measured were the same, or if averages were concluded. The more time the child was allowed in the space, the more distance he would conjure up. Also, each child should still be analyzed and then the average distances should be found between all subjects for a more accurate reading.

REFERENCES

Rendezvous with the U: How Architecture Shapes Behavior,

© 2009 Regents of the University of Minnesota. All rights reserved.

Last modified on January 9, 2009

<https://events.umn.edu/Rendezvous-with-the-U-lecture-How-Architecture-Shapes-Behavior-006132.htm>

3xn, *Approach*, Strandgade 73

<http://www.3xn.dk/>

Dartfish, *About Us*

<http://www.dartfish.com/en/about-us/index.htm>

Dartfish, *Media Gallery*

<http://www.dartfish.com/en/media-gallery/product-documentation/index.htm>

NDSU Center for Child Development

http://www.ndsu.edu/hdfs/center_for_child_development/

ACKNOWLEDGMENTS

NDSU Center for Child Development

Liaison: Ganapathy Mahalingam

Professor and Head of the AIA Department of NDSU

(North Dakota State University)

Ganapathy.Mahalingam@ndsu.edu

108 B Renaissance Hall

Fargo, ND 58102

?? ?

?



Laura N. Brunik
511 140th Ave NE
Ham Lake, MN 55304

Laura.Brunik@ndsu.edu

763-412-5484

“I think there’s much more to know as the world expands.”
Betsy Bermingham, NDSU Associate English Professor

“The purpose of the Wellness Center is to support the academic mission of NDSU by providing an environment where students may learn behaviors conducive to creating healthy lifestyles. Wellness, which is about making healthy lifestyle choices regarding mind, body, and spirit, is the common thread of the Center’s programs and services.”
Wallman Wellness Center Mission Statement

?