



Labs in Life: Summative Evaluation of Exhibit

July 2011

Prepared for:
COSI

Prepared by:
Joe E. Heimlich, PhD
Victor Yocco, PhD

Institute *for* Learning Innovation

3168 Braverton St. Suite 280, Edgewater, MD 21037 t: 410-956-5144 f: 410-956-5148 www.ilinet.org
Understanding, fostering, and promoting lifelong learning

About the Institute for Learning Innovation:

Established in 1986 as an independent non-governmental not-for-profit learning research and development organization, the Institute for Learning Innovation is dedicated to changing the world of education and learning by understanding, facilitating, advocating and communicating about free-choice learning across the life span. The Institute provides leadership in this area by collaborating with a variety of free-choice learning institutions such as museums, other cultural institutions, public television stations, libraries, community-based organizations such as scouts and the YWCA, scientific societies and humanities councils, as well as schools and universities. These collaborations strive to advance understanding, facilitate and improve the learning potential of these organizations by incorporating free-choice learning principles in their work.



Executive Summary

The Institute for Learning Innovation (ILI) conducted the summative evaluation for the IMLS funded COSI exhibit: *Labs in Life* (LG-26-08-0146). The purpose of the summative evaluation was to examine the connections COSI visitors make between the various components of *Labs in Life* and the research being conducted in view of the exhibit area. Target audiences identified by COSI include intergenerational groups with children age eight to 12 as well as middle school age youth. The summative evaluation also examines the differences between group in how they interact with the exhibit components and in the connections made by these groups between the exhibit components.

Data were collected using three methods: observation, interview, and questionnaire. Purposeful samples were obtained to ensure data were acquired from the target audience. The observation sample (N= 70) contained 35 intergenerational groups containing children between the ages of eight and 12 and 35 child only groups. Interviews (N= 75) were conducted with 25 participants who were in groups with adults only or with children not in the target age groups, 25 participants who were adults with children age eight to 12 in their groups, and 25 interviews with teenagers age 13 to 18 as a proxy for middle school age children.

To what degree and in what ways do visitors, especially members of the two target audiences, make connections between and among activities?

Examining connections visitors make between and among activities found that engagement by individual component shows that for Heart Rate Arena, Strength, and Flexibility activities, both children and adults in intergenerational groups are very likely to engage in the activity over all other observed behaviors. Data from the observations revealed that Intergenerational groups were highly engaged with the components in *Labs in Life* that they were observed interacting with, as well as highly engaged with each other. Findings from observing the intergenerational groups (n=35) suggest that the behaviors participants were most likely to be observed engaged in included engaging in the activity promoted by the specific component (n= 21 adults; 32 children), observing other group members engaging with the component (n= 20 adults; 29 children), talking with other group members while engaging with the component (n= 22 adults; 22 children), and discussing content with other group members specific to the activity they were engaged in (n= 20 adults, 18 children). Observations of the children only groups strongly suggests that participants from these groups were most likely to engage in the activity (n= 32) and for the most part talk to each other while doing the activity (n= 29). Children only groups were less likely to observe another group member engaging in activity (n= 24) than those in intergenerational groups.

Interview participant response suggests that visitors to *Labs in Life* do think that the various activities make sense being grouped together. This would suggest that participants view their experience at the different activities in *Labs in Life* as being related to each other. Participants were asked to discuss what they thought was the purpose of the activities in *Labs in Life* or what the common theme for the area was. Codes were created based on the trends emerging from analysis of the data. Findings suggest that there were a wide range of messages participants of all ages were receiving from the exhibit components, and that these were influenced by the specific activities that the participants engaged in.

There were few differences in the top three codes for each group, however there were a number of codes that were represented only by specific groups. Codes reflecting responses that the purpose of the



exhibit was related to education or sports were only given to responses from teenage participants. Codes reflecting obesity were only given to responses from adults with children age eight to 12 in their group, as well as codes reflecting that the participant had only chosen to watch the others in their group but did not get a deeper message from the experience. A participant from an adults only group was the only one to receive a code for stating the exhibit was about muscles. These small differences in what participants feel the purpose of the exhibit is may reflect actual differences among groups of visitors, based on group type, in what key messages visitors are getting from *Labs in Life*.

Questionnaire participants were largely positive in stating that it did make sense to them why each of the various activities were located in *Labs in Life*. The Heart Rate Arena activity (Mean= 6.57) and the Strength activity (Mean= 6.43) had the highest means overall and by group type suggesting these two activities being located in *Labs in Life* made the most sense to participants. The touch screen reporting results had the lowest mean (Mean= 5.99) among the in *Labs in Life*. There were no significant differences between groups on these items.

To what degree and in what ways do visitors, especially in the target audiences, make connections between the activities and the research being conducted in the Labs? Are there potential variables that might explain differences, if any, in conditions?

Fifty two participants (69%) stated they were aware that research was taking place in the lab. These same participants were asked what research they thought was taking place in the lab; as reflected in Table 6 the top three responses coded were participants mentioning specific machines on display in the lab (n= 18), that the research was about exercise (n= 12), and that the lab was “testing” people’s abilities (n= 12). The emergence of 15 codes for participants’ responses suggests that a wide range of messages or interpretations of the activities taking place in the lab are being received and given by participants.

In general across groups interview participants felt each of the components of *Labs in Life* were more appropriate as user age increased.

Questionnaire participants had moderate positive levels of agreement that each of the components of *Labs in Life* relate back to the research taking place in the lab with each item having an overall mean of 5.54 or higher. Standard deviations ranged from 1.08 to 1.59 overall for the items measured. The Heart Rate Arena activity had the highest mean overall (Mean= 6.01; SD= 1.08) and by group followed by the stretching activity (Mean= 5.81; SD= 1.18) and then the strength activity (Mean= 5.75; SD= 1.23). The touch screens had the lowest mean overall and by group (Mean= 5.54; SD= 1.59), with 57 percent (n= 150) of the questionnaires responding to this item being collected prior to the installation of the Nutrition program.

Participants rated items measuring importance of the health message for each component. The Heart Rate Arena activity was given the highest mean (Mean= 6.67; SD= 0.69) followed by the Strength activity (Mean = 6.28; SD= 1.07), and the lab area (Mean= 6.22; SD= 1.09). The Flexibility activity had the lowest mean among the items both total (Mean= 6.01; SD= 1.23) and between groups. The heart rate arena activity had a low standard deviation, below 1.00, overall and for each group, suggesting rather uniform high levels of agreement among all participants that the heart rate arena activity had an important health message. The findings indicate that adults with children ages eight to 12 in their groups rated each of these items measuring the importance of the health message for each component, with the exception of the touch screen item, significantly higher than teenage participants.



Participants were slightly positive in their responses to the items measuring their perceptions of whether they had learned an important health science component from each of the activities. Consistent with findings throughout the study, the Heart Rate Arena was again given the highest mean score overall (Mean= 5.41; SD= 1.27) and by group type. The touch screens were given the second highest mean score overall (Mean= 4.90; SD= 1.76). This finding is attributed to a boost in scores given by participants after the Nutrition kiosk was installed. The Strength activity was given the third highest total mean score by participants (Mean= 4.78; SD= 1.50). The lab was given the lowest total mean score for these items (Mean= 4.70; SD= 1.48). Adults with children age eight to 12 in their groups had a mean significantly higher than teenage participants for the item: *the heart rate arena activity taught me an important health science component*.



TABLE OF CONTENTS

Executive Summary	ii
List of Tables	vi
Introduction	1
Project Background	1
Evaluation Questions	2
Methods	2
Observation of Visitors	2
Intercept Interviews	2
Questionnaires	2
Sample Bias	3
Results	3
Sample Description	3
<i>Observation</i>	3
<i>Intercept Interviews</i>	3
<i>Questionnaires</i>	3
To what degree and in what ways do visitors, especially members of the two target audiences, make connections between and among activities?	4
<i>Observation</i>	4
<i>Interview</i>	6
<i>Questionnaire</i>	8
To what degree and in what ways do visitors, especially in the target audiences, make connections between the activities and the research being conducted in the Labs? Are there potential variables that might explain differences, if any, in conditions?	9
<i>Interview</i>	9
<i>Questionnaire</i>	17
<i>Touch screens: Pre-Nutrition installation compared to post-Nutrition installation</i>	19
Conclusions	20



List of Tables

Table 1: Observation activities of intergenerational groups, frequency (percent of total at each component).....	5
Table 2: Observation activities of children only groups, frequency (percent of total at each component)	6
Table 3: Activities engaged in by interview participants. Frequency and (percent of group).....	7
Table 4: Frequency of codes by group and examples for participant response to the purpose of Labs in Life.....	8
Table 5: Mean and Standard deviation for “It made sense to me why...” items.....	9
Table 6: What current research is taking place in the lab coded responses, frequency by group type.....	10
Table 7: How appropriate is the Heart Rate Arena activity rankings, frequency by participant group type	12
Table 8: How appropriate are the Flexibility and Strength activities rankings, frequency by participant group type.....	14
Table 9: How appropriate is the Performance touch screen rankings, frequency by participant group type	15
Table 10: How appropriate is the Lab area rankings, frequency by participant group type	16
Table 11: Activities relate to the research taking place in the lab, mean and standard deviation total and by group type	17
Table 12: Activities had an important health message, mean and standard deviation total and by group type	18
Table 13: Activities taught me an important health science component, mean and standard deviation total and by group type.....	19
Table 14: Touch screen items mean and standard deviation: Pre-Nutrition installation compared to Post-Nutrition installation.....	20



Introduction

Project Background

In 2008, COSI received funding from the Institute of Museum and Library Services to develop the exhibit *Labs in Life* (LG-26-08-0146). The development of the *Labs in Life* embodies a unique model for collaboration, with active researchers interested in research outcomes while simultaneously serving as models for the public, and science center staff concurrently gleaning new and changing content for exhibits and programs. While each partner is motivated by many different goals, all agree that they are interested in stimulating public interest in and understanding of science and technology, encouraging young people to consider careers in the sciences and supporting adults to become more scientifically literate. In fulfillment of the funding requirements, COSI partnered with the Institute for Learning Innovation to conduct the summative evaluation of *Labs in Life*. Because sustainable and successful operation of the OSU lab and the related COSI programs and exhibits are dependent on the fulfillment of the expectations of the participants from both organizations, the evaluation plan focused on examining factors related to the visible science activity: specifically, proximity to the “real researcher” doing “real science” and level of engagement in the research as a subject or comparing self to subjects. From internal COSI documents on *Labs in Life*, the space was designed for research on the science learning in the space as well as the research going on in the labs: “There are two avenues of pursuit for this research, evaluation of the types of activities constructed for visitor engagement in the context of a specific project in which laboratory research is showcased and a study of the proximity and level of engagement and their impact on perceived engagement, knowledge, attitude, and skills, ultimately leading toward the behavioral outcomes for COSI across ages and stages of visitors” (COSI, 2008).

There are a number of individual components to *Labs in Life*, which together form the whole of the exhibit:

- Heart Rate Arena Activity –measure resting hear rate, participate in an activity designed to elevate heart rate, and then re-measure heart rate after the activity
- Strength Station– measures upper body strength
- Flexibility Station – test flexibility
- Performance Station – visitors have access to punch cards, which allow them to record their results at each station/activity. These results can be entered into the touch screens at the performance station. Visitors then can see how their results compare with other COSI visitors and with others around the country.
- Nutrition – Located next to the performance station kiosk, this activity allows visitors to create one day of meals, attempting to meet the new US dietary guidelines. NOTE: Nutrition was not installed and functional for the entire period of data collection. Where applicable it is noted that Nutrition was part of the study.
- The Lab Area – Researchers conduct real research on health and fitness using equipment such as the “Bod Pod” which measures body composition, a “Dexa” that measures bone density, and a TV with a Nintendo Wii attached that is part of a study on the use of video games to promote healthy activity.



Evaluation Questions

This summative evaluation of *Labs in Life* will focus on two questions that 1) address the original concepts for the Labs, and 2) emerged from the remedial evaluations conducted by the COSI internal evaluator, Rita Deedrick, Senior Director, Research & Evaluation at COSI. Given the findings in the remedial and the goal of the project, the evaluation team has determined that the driving outcome messages relate to evaluation of the activities constructed for engagement in the context of a project. The two target audiences as identified in the proposal are 1) families with children ages 8-12, and 2) middle-school aged youth. The questions that will drive this accountability study are:

Question 1: To what degree and in what ways do visitors, especially members of the two target audiences, make connections between and among activities?

Question 2: To what degree and in what ways do visitors, especially in the target audiences, make connections between the activities and the research being conducted in the Labs? Are there potential variables that might explain differences, if any, in conditions?

Methods

To address these evaluation questions, ILI utilized three discreet measurement components: 1) observation, 2) interviews, and 3) questionnaire.

Observation of Visitors

An observation checklist was created based on preliminary observation of how visitors interacted with the different *Labs in Life* components. A total of 70 observations were made, 35 were of intact, intergenerational groups with youth visually deemed to be in the target ages, and 35 observations were made of individuals in youth only groups. Data were analyzed using SPSS to identify trends and central tendencies.

Intercept Interviews

A partially open interview schedule was utilized to guide intercept interviews of both target audiences and other visitors. Twenty five completed interviews of each target audience (intergenerational groups with children age eight to 12 and teenagers), plus 25 other visitors were collected following their engagement with at least one *Labs in Life* component. Continual focal sampling process was used to ensure approximate random sampling. After the 25 visitors not fitting a target audience was reached, those not fitting the target profile were not included in the focal sampling process. Data were analyzed by the evaluators using a trend analysis with emerging trends being used to code participant response.

Questionnaires

A paper and pencil questionnaire asking scaled ranking questions surrounding the two dominant questions was administered to 125 of each of the target audiences and 100 other visitors (N= 325). Data were entered and analyzed using SPSS v. 19.



Sample Bias

It is important to note potential sources of bias within these samples. The observations, interviews, and questionnaires did use procedures to randomize recruitment of visitors for the interviews as much as possible within the constraints of a museum context. However, due to constraints of staffing, it was not possible to evenly distribute data collection days and times over the course of the entire data collection period (over the course of two months), with data collected more frequently on weekdays. Consequently, the data may be representative of the days on which data was collected, and generalizations of results to all COSI visitors should be made with caution.

Results

Sample Description

Observation

A total of 70 groups were observed, 35 groups that visually were youth in their middle school (teenage) years, and 35 intergenerational groups containing adults and youth visually age 8 to 12. For the intergenerational groups, 11 (31%) groups had a one child in the target age range, 15 (43%) had two children in the target age range, 8 (23%) had three children in the target age range, and one (3%) had four children in the target age range. Twenty two (63%) of the intergenerational groups contained one adult, 11 (31%) contained two adults, and two (6%) contained three adults. For the children only groups that were observed, 20 (57%) contained two children in the targeted age range, 11 (31%) contained three children in the targeted age range, three (9%) contained four children in the targeted age range, and one (4%) contained five children in the targeted age range. No other inferences regarding age or male/female status are made from these observations.

Intercept Interviews

A total of 75 intercept interviews were completed. Twenty-five were conducted with individuals in groups that included children ages 8 to 12 years old, 25 were conducted with individual teenagers ages 13 to 18 (a proxy for middle school age children), and 25 were conducted with groups containing adults only or children outside of the target audience range. Forty-one participants (55%) stated they were female, 34 stated (45%) stated they were male.

Questionnaires

A total of 350 questionnaires were administered, 125 to groups containing an eight to 12 year old, 125 to teenagers age 13 to 18 (a proxy group for middle school age children), and 100 to adult only groups or groups with children not in the target age groups. Fifty-eight (17%) participants stated they were COSI members, 255 (73%) stated they have visited COSI at some point in the past, and 37 (11%) stated they had visited *Labs in Life* prior to the date they were participating in the study. One hundred ninety five (56%) participants who provided this information were female, 152 (44%) male.



To what degree and in what ways do visitors, especially members of the two target audiences, make connections between and among activities?

Observation

Intergenerational Groups

Intergenerational groups observed were highly engaged with the components in *Labs in Life* that they were observed interacting with, as well as highly engaged with each other. Findings from observing the intergenerational groups (n=35) suggest that the behaviors participants were most likely to be observed engaged in included engaging in the activity promoted by the specific component (n= 21 adults; 32 children), observing other group members engaging with the component (n= 20 adults; 29 children), talking with other group members while engaging with the component (n= 22 adults; 22 children), and discussing content with other group members specific to the activity they were engaged in (n= 20 adults, 18 children). Intergenerational group participants were less likely to be observed engaging in collaboration with other group members, reading or asking for directions, and sharing the results of the activities with other group members. Only two groups (6%) were observed with adults having no engagement with the component, and two groups (6%) were observed with children having no engagement with the component.

Examining engagement by individual component finds that for Heart Rate Arena, Strength, and Flexibility activities, both children and adults in intergenerational groups are very likely to engage in the activity over all other observed behaviors. Table 1 displays that for these three components all members of an intergenerational group were very likely to engage in the activity, to observe others engage in the activity, and to talk to group members while engaging in the activity. Participants were most likely to collaborate on the Flexibility or the Heart Rate Arena components. Engagement with the Lab Area was recorded if a participant was observed approaching the on-duty lab workers and asking questions prior to the lab worker approaching them. No adults were observed leading an engagement with the touch screen performance kiosk. Overall, the observations suggest that intergenerational group participants do engage with the components of labs in life across members of the group, and that connections are made between group members among the individual *Labs in Life* components. These connections are being facilitated through intergenerational group dialogue, while the activity is being engaged in.

One component of interacting with the components of *Labs in Life* is the ability to receive scores on the various activities engaged in. These scores can then be entered into the Performance touch screen kiosk, which displays a comparison between the visitor's performance scores and the performance scores of others. In order to facilitate visitors' ability to keep track of their scores, COSI has available punch cards for visitors to punch out the corresponding numbers for each of the components. These cards are placed in various locations along the walls of *Labs in Life*. Two intergenerational groups (6%) were observed utilizing the punch cards available for visitors to record their scores on the different activities located in *Labs in Life*. Adult group members facilitated the children's use of the cards. No children only groups were observed utilizing the punch cards.



Table 1: Observation activities of intergenerational groups, frequency (percent of total at each component)

Labs in Life activity	Directed/engaged in the activity		Observed another group member engage in activity		Collaborating with group members		Talked while engaging in activity		Discussed content specific to activity		Asked for or read directions out loud		Shared results with group		No observable engagement	
	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child
% of N=35																
Strength (n= 10; 28.6%)	7 (70)	10 (100)	8 (80)	6 (60)	2 (20)	2 (20)	6 (60)	6 (60)	4 (40)	3 (30)	5 (50)	3 (30)	4 (40)	4 (40)	0 (0)	0 (0)
Heart Rate Arena (n= 9; 25.7%)	7 (78)	9 (100)	2 (22)	9 (100)	5 (56)	4 (44)	5 (56)	5 (56)	4 (44)	4 (44)	3 (33)	3 (33)	2 (22)	1 (11)	0 (0)	0 (0)
Flexibility (n= 8; 22.9%)	6 (75)	8 (100)	5 (63)	5 (63)	5 (63)	4 (50)	8 (100)	7 (88)	7 (88)	6 (75)	5 (63)	4 (50)	4 (50)	3 (38)	0 (0)	0 (0)
Lab area (n= 5; 14.3%)	1 (20)	2 (40)	3 (60)	4 (80)	0 (0)	0 (0)	3 (60)	2 (40)	3 (60)	3 (60)	0 (0)	0 (0)	1 (20)	1 (20)	1 (20)	2 (40)
Performance (n= 3; 8.6%)	0 (0)	3 (100)	2 (67)	2 (67)	1 (33)	1 (33)	2 (67)	2 (67)	2 (67)	2 (67)	1 (33)	1 (33)	1 (33)	2 (67)	1 (33)	0 (0)
Total (N= 35)	21 (60)	32 (91)	20 (57)	29 (83)	13 (37)	11 (31)	22 (63)	22 (63)	20 (57)	18 (51)	14 (40)	11 (31)	12 (34)	11 (31)	2 (6)	2 (6)

Note: Displayed in descending order of frequency of component interaction



Children Only Groups

Observations of the children only groups strongly suggests that participants from these groups were most likely to engage in the activity (n= 32) and for the most part talk to each other while doing the activity (n= 29). Children only groups were less likely to observe another group member engaging in activity (n= 24) than those in intergenerational groups. As displayed in Table 2, these participants were most likely to collaborate while doing the Heart Rate Arena activity or the Flexibility activity. Participants in children only groups were least likely to share results with others (n= 17) or to ask for or read directions (n= 18) with the exception of the Flexibility activity. About half of the observed children only groups discussed the content of the activity they were engaged in. This is in line with the findings from the intergenerational groups and suggests that approximately half of those coming through *Labs in Life* do engage in a discussion of the content of the activities. That no children only participants were observed engaging in the Lab area reflects the nature of the Lab activities and that only a few select children are able to engage in activities at any given time and with fewer able to engage during the time that observations took place.

Table 2: Observation activities of children only groups, frequency (percent of total at each component)

Labs in Life activity	Directed/ engaged in the activity	Observed another group member engage in activity	Child(ren) collaborated	Talked while engaging in activity	Discussed content specific to activity	Asked for or read directions out loud	Shared results with group
Heart Rate Arena (n= 10; 28.6%)	10 (100)	5 (50)	8 (80)	7 (70)	2 (20)	3 (30)	2 (20)
Strength (n= 6; 17.1%)	6 (100)	5 (83)	2 (33)	5 (83)	4 (67)	2 (33)	3 (50)
Flexibility (n= 12; 34.3%)	12 (100)	9 (75)	9 (75)	12 (100)	9 (75)	10 (83)	10 (83)
Performance (n= 4; 11.4%)	4 (100)	2 (50)	0 (0)	2 (50)	1 (25)	1 (25)	1 (25)
Lab area (n= 3; 8.6%)	0 (0)	3 (100)	0 (0)	3 (100)	2 (67)	2 (67)	1 (33)
Total (N= 35)	32 (91)	24 (69)	19 (54)	29 (83)	18 (51)	18 (51)	17 (49)

Note: Displayed in descending order of frequency of component interaction of intergenerational groups

Across both groups of observations, thirty-eight total groups (54%) were observed moving on to another *Labs in Life* component, suggesting that participants were making connections between the different activities. Seventeen (49%) intergenerational groups were observed engaging in another *Labs in Life* component after the initial component, 21 (60%) of children only groups were observed engaging in another *Labs in Life* component after the initial component. Children only groups appear more likely to engage in multiple components of the exhibit area than intergenerational groups, which may suggest that children only groups have the potential to make a greater connection between the activities in *Labs in Life*.

Interview

Participants in the interview were asked to list which components they had engaged in and to describe



the purpose of these *Labs in Life* activities. Table 3 shows the frequency by group type for engagement with each activity by interview participants. Adult only groups were most likely to engage in the Flexibility, followed by the Strength, and Heart Rate Arena activities’ both adults with children ages 8-12 and teens were most likely to engage in Heart Rate Arena, followed by Strength and Flexibility. Only groups containing adults (n=9) reported not engaging in any of the activities but watching others in their group engage in activities.

Table 3: Activities engaged in by interview participants. Frequency and (percent of group)

Activity	Adult only or adults with kids not in target range (n= 25)	Adult with children age 8 to 12 (n= 25)	Teenager age 13-18 (n= 25)	Total (N= 75)
Heart rate arena	11 (44)	15 (60)	17 (68)	43 (57)
Strength	12 (48)	9 (36)	14 (56)	35 (47)
Flexibility	14 (56)	8 (32)	13 (52)	35 (47)
Performance touch screen	5 (20)	8 (32)	7 (28)	20 (27)
Lab area	5 (20)	6 (24)	9 (36)	20 (27)
Watched others in group only	2 (8)	7 (28)	0 (0)	9 (12)

Note: participants were allowed to select multiple activities

Participants were asked to discuss what they thought was the purpose of the activities in *Labs in Life*, or what the common theme for the area was. Analysis codes were created based on the trends emerging from analysis of the data. Findings suggest that a wide range of messages were taken from the exhibit components, and that these messages were influenced by the specific activities in which the participants engaged. Table 4 displays the frequency of each code by group type and gives an example for each code from the data. Overall, responses related to the specific activities available in *Labs in Life* were the most frequently coded (n= 32), followed by responses reflecting that exercise is the main purpose of the area (n= 24), and responses suggesting that health is the main purpose (n= 22). Examining the frequency of responses by group type finds that Adult only groups most frequently coded response was activity specific (n= 12), followed by health (n= 9) and then exercise (n=5). The most frequently coded response for adults with children age eight to 12 in their group was exercise (n= 12), followed by activity specific response (n= 9) or health (n= 9). Teenager’s most frequently coded response was activity specific (n= 11), followed by exercise (n= 7) and then responses reflecting that they interacted with the area as part of a group (n= 6).

There were few differences in the rankings of the top three codes among the groups, however there were a number of codes represented only by specific groups. Codes reflecting responses that the purpose of the exhibit was related to education or sports were only given to responses from teenage participants. Codes reflecting obesity were only applied to responses from adults with children age eight to 12 in their group, as well as codes reflecting that the participant had only chosen to watch the others in their group but did not get a deeper message from the experience. A participant from an adults only group was the only one to receive a code for stating the exhibit was about muscles. These small differences in what participants feel the purpose of the exhibit is may reflect actual differences among groups of visitors, based on group type, in what key messages visitors are getting from *Labs in Life*.



Table 4: Frequency of codes by group and examples for participant response to the purpose of Labs in Life.

Code	Examples	Adult only or adults with kids not in the target range	Adult with children age 8 to 12	Teenager age 13 to 18	Total
Activity specific	Did the activity and measured heart rate, then tested my flexibility and how strong I am	12	9	11	32
Exercise	About making exercise fun.	5	12	7	24
Health	It's all about being healthy. You have to have health if you want to enjoy life	9	9	4	22
Games	My kids played the game and did their heart rate. Then they did the TV - it teaches them more about their health.	3	7	5	15
Fitness	This area is all about physical fitness and the importance of keeping track of your health information.	5	6	3	14
Interacted as group	Stood in line to hit the buttons with my friends, it's about getting exercise.	3	5	6	14
Testing/measuring	We kept our scores on the different tests, compared our fitness with others on the screen. This is about fitness and health	4	2	3	9
Your body	Your body's flexibility and strength. Functions of the human body.	4	0	4	8
Nutrition	Physical fitness, health, nutrition	2	0	2	4
Watched lab worker	Watched the guy test out the machine (bod pod) and went and tested my flexibility and strength.	0	2	1	3
14 - sports	Sports and training, physical fitness	0	0	2	2
15 - education	Educate smaller children - we came here to do the games	0	0	2	2
4 – obesity	Played a game, measured our HR. About getting people active, obesity is a real problem	0	2	0	2
2 – muscles	It's about muscles and the human body	1	0	0	1
13 - I only watched	I just watched	0	1	0	1
88 - unrelated		0	0	1	1

Note: codes displayed in descending frequency of total

Questionnaire

Participant response suggests that visitors to *Labs in Life* think that the various activities make sense being grouped together and the activities in *Labs in Life* are related to each other. There is not strong



evidence that group type has an effect on this belief, with the small differences between groups not revealing a meaningful pattern.

Participants were asked to rate an item stating that it makes sense to them why each of the various activities are located within *Labs in Life*. Participants were only asked to respond to items reflecting activities in which they had engaged. Participants were largely positive, stating that it did make sense to them why each of the various activities were located in *Labs in Life*. Table 5 reflects the mean and standard deviation for each item total and by group. The Heart Rate Arena activity (Mean= 6.57) and the Strength activity (Mean= 6.43) had the highest means overall and by group type revealing that these two activities being located in *Labs in Life* made the most sense to participants. The touch screen reporting results had the lowest mean (Mean= 5.99) among the in *Labs in Life*, although this is still a clearly positive outcome. Standard deviations were relatively low across the items overall and by group type suggesting consistency across respondents. There were no significant differences found between groups for any of the five items listed.

Table 5: Mean and Standard deviation for “It made sense to me why...” items

Statement	Total		Teenager age 13 to 18		Adult only or adults with kids not in the target range		Adult with children age 8 to 12		p-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
the heart rate arena activity was located in <i>Labs in Life</i> (n=299)	6.57	0.73	6.47	0.89	6.59	0.71	6.63	0.56	.277
The strength activity was located in <i>Labs in Life</i> (n= 302)	6.43	0.84	6.49	0.83	6.46	0.80	6.35	0.87	.388
The OSU research lab was located in <i>Labs in Life</i> (n= 306)	6.05	1.11	5.90	1.03	6.05	1.10	6.21	1.20	.125
The stretching activity was located in <i>Labs in Life</i> (n= 304)	6.26	0.98	6.22	1.03	6.24	1.02	6.31	0.91	.760
The touch screens reporting results were located in <i>Labs in Life</i> (n= 262)	5.99	1.31	5.98	1.28	5.80	1.40	6.13	1.28	.276

Note: items displayed in descending order of total mean

To what degree and in what ways do visitors, especially in the target audiences, make connections between the activities and the research being conducted in the Labs? Are there potential variables that might explain differences, if any, in conditions?

Interview

A purpose of the interview was to examine the basic awareness visitors have of the research laboratories located in *Labs in Life*. Interviewees reflected a high level of awareness that the research lab is present and that research is taking place in *Labs in Life*. Fifty two participants (69%) stated they were aware that research was taking place in the lab. These same participants were asked what research they thought was taking place in the lab; as reflected in Table 6 the top three responses coded were participants mentioning specific machines on display in the lab (n= 18), that the research was about exercise (n= 12), and that the lab was “testing” people’s abilities (n= 12). The emergence of 15 codes for participants’ responses suggests that a wide range of messages or interpretations of the activities taking



place in the lab are being received and given by participants. While most of these focus on issues that are covered in the *Labs in Life* exhibit, there is no clearly defined topic that emerges. Quite often the responses reflected a surface level understanding of the machinery or activities on display and not the underlying research being done in the lab area. Examining the responses coded for what is research is taking place in the lab does suggest that the topics covered by the various activities in *Labs in Life* are reflected in these responses. This suggests that participants who visit *Labs in Life* are making direct connections between the topics covered by the activities and the research they believe is taking place in the lab.

Examining the responses by group type finds that adult only or adults with children outside of the target range groups' top responses were consistent with the overall total top responses. Adults with children ages eight to 12 in their group were most frequently given the code for machines (n= 7), followed by the code for they were curious to know more or unsure of what was going on in the lab (n= 6), followed by codes for exercise (n= 3) and lab research (n= 3). Teens' had two top responses, with six participants commenting on the presence of research using the Wii video game system and six commenting on the research focusing on exercise. These were followed by comments reflecting the lab workers were "testing" things (n= 5) and commenting on the machines in the lab (n= 5). Teen participants were more likely than both other groups combined to note the presence of the Wii video game system, while no teens mentioned the research being about your body or medicine/doctors' office. Adults with children age eight to 12 in their group were the only ones to mention that "lab work" was taking place in the lab (n= 3). Three codes were only given to one participant each from the adult only group: dentists, physiology, and obesity. Bone density (not the machine) was coded for one participant in the adult with children age eight to 12 group. These small differences between groups on the research taking place in the labs might reflect larger perceptual differences among the populations of visitors, by group type and social role, to *Labs in Life*.

Table 6: What current research is taking place in the lab coded responses, frequency by group type.

Code	Examples	Adult only or adults with kids not in the target range	Adult with children age 8 to 12	Teenager age 13 to 18	Total
Machines	I was really impressed with the bone density machine.	6	7	5	18
Exercise	Just exercise. Everything here is about exercise in this part.	5	3	6	14
Testing things	It looks like physical fitness testing	5	2	5	12
Curious to know more/not really sure	It definitely makes your curious to know what's going on.	3	6	2	11



Wii	We read about the research on kids running and about using the Wii thing for exercise.	2	2	6	10
Nutrition/food	It's about food and eating right, also exercise.	3	2	2	7
Research using children	I read that they want kids to be part of a study	1	1	2	4
Body	It's about your body and testing things	1	2	0	3
Medicine/doctor's office	I saw it when we walked in. Looks like they are in a doctor's office	1	2	0	3
Lab research	Workers in a lab	0	3	0	3
Health	Testing peoples abilities and health	0	1	1	2
Dentists	About dentists and cavities because of food. I know about this because it is being done through my school.	1	0	0	1
Physiology	I know it is OSU physiology doing the research	1	0	0	1
Obesity	I see lab equipment and exercise machines. The TV says its about obesity	1	0	0	1
Bone density	Yeah about how much body mass people have and bone density	0	1	0	1

How appropriate are these activities?

One potential variable presupposed to influence conditions between the connections groups made with the research in the lab and the various components of *Labs in Life* is the age of the participants. Interview participants were asked to rank how appropriate they felt each of the activities they had encountered in *Labs in Life* were for a variety of age groups: two to five year olds, six to seven year olds, eight to twelve year olds, 13 to 21 year olds, and adults over the age of 21.

Table 7 displays group ranking of the Heart Rate Arena by frequency and percent. In general, participants' ranking of appropriateness increased with age level, with the activity being rated not at all appropriate by participants only for those in the two to five year old range (n= 8). Teenagers were more likely to rate the Heart Rate Arena activity as being specifically designed for those ages 13 to 21 (n= 8). No participants rated that the Heart Rate Arena exercise was specifically designed for children ages two to five. Most participants between and within groups ranked the activity as being good for six to seven year olds (n= 29), eight to 12 year olds (n= 35) and adults over the age of 21 (n= 28). Most adult only (n= 7) and adults with children age eight to twelve years old in their group (n= 13) rated the Heart Rate Arena activity as being good for 13 to 21 year olds.

The Heart Rate Arena appears to be seen by visitors as a good activity for children and adults, with it being more designed message-wise for teens through adults.



Table 7: How appropriate is the Heart Rate Arena activity rankings, frequency by participant group type

Age Group	Adult only or adults with kids not in the target range (n= 12)					Adult with children age 8 to 12 (n= 21)					Teenager age 13 to 18 (n= 20)				
	Not at all	Some-what	It's OK	It's good for this group	It was designed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was designed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was designed specifically for this group
2-5 year olds	2 (17)	5 (42)	1 (8)	4 (33)	0 (0)	4 (19)	8 (38)	6 (29)	3 (14)	0 (0)	2 (10)	6 (30)	6 (30)	6 (30)	0 (0)
6-7 year olds	1 (8)	0 (0)	3 (25)	7 (58)	1 (8)	0 (0)	3 (14)	6 (29)	11 (52)	1 (5)	0 (0)	2 (10)	6 (30)	11 (55)	1 (5)
8-12 year olds	0 (0)	2 (17)	0 (0)	8 (67)	2 (17)	0 (0)	0 (0)	3 (14)	14 (67)	4 (19)	0 (0)	0 (0)	3 (15)	13 (65)	4 (20)
13-21 year olds	0 (0)	0 (0)	1 (8)	7 (58)	4 (33)	0 (0)	0 (0)	1 (5)	13 (62)	7 (33)	0 (0)	0 (0)	1 (5)	7 (35)	12 (60)
Adults over 21	0 (0)	0 (0)	0 (0)	7 (58)	5 (42)	0 (0)	0 (0)	1 (5)	12 (57)	8 (38)	0 (0)	0 (0)	3 (15)	9 (45)	8 (40)



Table 8 displays the frequency and percent by group ranking of the Flexibility and Strength activities. In general, participants increased the ranking of appropriateness as the age level increased. Most adult only (n= 7) and adults with children age eight to twelve years old (n= 8) in their group rated the activities as not at all appropriate for those in the two to five year old range (n= 15). Two teenagers noted these activities are not at all appropriate for two to five year olds. Teenagers were more likely to rate the activities as being specifically designed for those ages 13 to 21 (n= 9) or as being specifically designed for those over the age of 21 (n= 8). No participants rated that the Strength and Flexibility activities were specifically designed for children ages two to five. Adult group only participants were most likely to rank the activities as being good for this group for six to seven year olds (n= 8), while teenagers (n= 7) and adults with children age eight to 12 (n= 3) were most likely to rank the activities as OK for those age six to seven. Most participants between and within groups ranked the activities as being good for this group for eight to 12 year olds (n= 28). Adults with children age eight to 12 (n= 8) and teenagers (n= 9) were most likely to rank these activities as being specifically designed for those age 13 to 21, adult only groups (n= 10) were most likely to rate the activity as being good for this group for those age 13 to 21. Adults with children age eight to 12 (n= 8) and teenagers (n= 9) were most likely to rank these activities as being specifically designed for those over the age of 21, adult only groups were most likely to rate the activity as being good for this group for those over the age of 21. In general, the activity appears to be seen by visitors as appropriate for teens and adults, with families with middle-school aged children seeing it as appropriate for that age of child while still being a good activity for adults.



Table 8: How appropriate are the Flexibility and Strength activities rankings, frequency by participant group type

Age Group	Adult only or adults with kids not in the target range (n= 17)					Adult with children age 8 to 12 (n= 15)					Teenager age 13 to 18 (n= 16)				
	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group
2-5 year olds	7 (41)	4 (24)	3 (18)	3 (18)	0 (0)	8 (53)	4 (27)	2 (13)	1 (7)	0 (0)	2 (13)	5 (31)	8 (50)	1 (6)	0 (0)
6-7 year olds	3 (18)	3 (18)	3 (18)	8 (47)	0 (0)	0 (0)	8 (53)	3 (20)	3 (20)	1 (7)	0 (0)	3 (19)	7 (44)	6 (38)	0 (0)
8-12 year olds	0 (0)	1 (6)	4 (24)	9 (53)	3 (18)	0 (0)	0 (0)	5 (33)	7 (47)	3 (20)	0 (0)	0 (0)	4 (25)	12 (75)	0 (0)
13-21 year olds	0 (0)	0 (0)	1 (6)	10 (59)	6 (35)	0 (0)	0 (0)	2 (13)	5 (33)	8 (53)	0 (0)	0 (0)	0 (0)	7 (44)	9 (56)
Adults over 21	0 (0)	0 (0)	0 (0)	11 (65)	6 (35)	0 (0)	0 (0)	2 (13)	6 (40)	7 (47)	0 (0)	0 (0)	1 (6)	7 (44)	8 (50)

Table 9 displays the frequency and percent by group type for each ranking of the Performance touch screen activity. Note that these data were collected prior to the installation of the Nutrition touch screen in the same kiosk area. Overall, participant ranking of appropriateness increased with age level. Most participants overall and between groups rated the activity as not at all appropriate for those in the two to five year old age range (n= 10). Teenagers (n= 5) were most likely to rate the activity as being specifically designed for those ages 13 to 21 and as being specifically designed for those over the age of 21 (n= 5). In terms of appropriateness for six to seven year olds, adult group only participants (2) ranked the activities as being good , adults with children age eight to 12 (n= 5) ranked the activity as somewhat appropriate, and teenagers (n= 5) rated the activity as it's OK. Most participants between and within groups ranked the activities as being good for this group for eight to 12 year olds (n= 13). Adult only groups (n= 4) and adults with children age eight to 12 (n= 5) were more likely to rank this activity as good for those age 13 to 21. Adults with children age eight to 12 (n= 5) and adult only groups (n= 5) were likely to rate the activity as being good for those over the age of 21. Although most respondents felt the activity itself was good for ages 6 and up, the overall perception was that it was designed for teens and



adults.

Table 9: How appropriate is the Performance touch screen rankings, frequency by participant group type

Age Group	Adult only or adults with kids not in the target range (n= 5)					Adult with children age 8 to 12 (n= 9)					Teenager age 13 to 18 (n= 9)				
	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group
2-5 year olds	2 (40)	2 (40)	0 (0)	1 (20)	0 (0)	5 (56)	2 (22)	2 (22)	0 (0)	0 (0)	3 (33)	3 (33)	2 (22)	1 (11)	0 (0)
6-7 year olds	1 (20)	1 (20)	1 (20)	2 (40)	0 (0)	0 (0)	5 (56)	1 (11)	3 (33)	0 (0)	0 (0)	2 (22)	5 (56)	2 (22)	0 (0)
8-12 year olds	0 (0)	1 (20)	0 (0)	4 (80)	0 (0)	0 (0)	0 (0)	3 (33)	4 (44)	2 (22)	0 (0)	0 (0)	3 (33)	5 (56)	1 (11)
13-21 year olds	0 (0)	0 (0)	1 (20)	4 (80)	0 (0)	0 (0)	0 (0)	0 (0)	5 (56)	4 (44)	0 (0)	0 (0)	1 (11)	3 (33)	5 (56)
Adults over 21	0 (0)	0 (0)	0 (0)	5 (100)	0 (0)	0 (0)	0 (0)	0 (0)	5 (56)	4 (44)	0 (0)	0 (0)	1 (11)	3 (33)	5 (56)

Note: Data were collected prior to the installation of the Nutrition touch screen.

Regarding the labs overall, the findings are consistent with the above in that participant rankings of appropriateness increased with age level. However, as displayed in Table 10, fewer participants noted that the lab area was not at all appropriate for those age two to five years old, with most participants overall and by group ranking the lab area as somewhat appropriate for children age two to five (n=12). For children aged six to seven, adult group only participants (n= 5) tended to rank the lab as being good for this group, adults with children age eight to 12 (n= 5) ranked the lab as somewhat appropriate, and most teenagers rated the lab as it's OK (n= 5) for those age six to seven years old. Most adult only group participants (n= 7) and adults with children ages eight to 12 (n= 5) and teenagers (n=5) ranked the lab as being good or it's OK (n=5) for eight to 12 year olds. For those aged 13 to 21, adult only groups (n= 7) ranked the lab as good, , teenagers (n= 7) were most likely to rank the lab as



being specifically designed for this age group, and adults with children age eight to 12 thought the labs were good (n= 4) and designed specifically for this group (n= 4). Adults with children age eight to 12 (n=6) and teenagers (n= 6) were most likely to rank the lab as being specifically designed for those over the age of 21. Adult only groups (n= 7) tended to rate the lab as being good for those over the age of 21. Overall, the Labs are considered accessible across ages, with intentional design for those 8-adult.

Table 10: How appropriate is the Lab area rankings, frequency by participant group type

Age Group	Adult only or adults with kids not in the target range (n= 9)					Adult with children age 8 to 12 (n= 12)					Teenager age 13 to 18 (n= 12)				
	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group	Not at all	Some-what	It's OK	It's good for this group	It was design ed specifically for this group
2-5 year olds	2 (22)	3 (33)	1 (11)	3 (33)	0 (0)	4 (33)	4 (33)	2 (17)	2 (17)	0 (0)	2(17)	5 (42)	4 (33)	1 (8)	0 (0)
6-7 year olds	1 (11)	1 (11)	2 (22)	5 (56)	0 (0)	0 (0)	5 (42)	3 (25)	3 (25)	0 (0)	0 (0)	4 (33)	5 (42)	3 (25)	0 (0)
8-12 year olds	0 (0)	1 (11)	1 (11)	7 (78)	0 (0)	0 (0)	0 (0)	4 (33)	5 (42)	2 (17)	0 (0)	1 (8)	5 (42)	5 (42)	1 (8)
13-21 year olds	0 (0)	0 (0)	1 (11)	7 (78)	1 (11)	0 (0)	0 (0)	3 (25)	4 (33)	4 (33)	0 (0)	1 (8)	1 (8)	3 (25)	7 (58)
Adults over 21	0 (0)	0 (0)	0 (0)	7 (78)	2 (22)	0 (0)	0 (0)	3 (25)	3 (25)	5 (42)	0 (0)	1 (8)	2 (17)	3 (25)	6 (50)



Questionnaire

The questionnaire quantified the strength of association participants had of the research taking place in the lab with the various components of *Labs in Life*. Overall findings suggest that participants had moderate, positive levels of agreement that each of the components of *Labs in Life* relates to the research occurring in the lab; each item has an overall mean of 5.54 or higher. Standard deviations ranged from 1.08 to 1.59 overall for the items measured revealing a fairly normal distribution. The Heart Rate Arena activity had the highest mean overall (Mean= 6.01; SD= 1.08) reflecting that participants saw the Heart Rate Arena as the most closely connected activity followed by the stretching activity (Mean= 5.81; SD= 1.18) and then the Strength activity (Mean= 5.75; SD= 1.23). The touch screens, though still positive, had the lowest mean overall (Mean= 5.54; SD= 1.59); 57 percent (n= 150) of the questionnaires responding to this item were collected prior to the installation of Nutrition.

Table 11 displays the mean and standard deviation for each item total and by group. Differences between group means for each of the items were not significant with no meaningful pattern emerging in differences between groups, suggesting that participants were in agreement across groups with rating the relationship between the activities and the research.

Table 11: Activities relate to the research taking place in the lab, mean and standard deviation total and by group type

	Total	Teenager age 13 to 18		Adult only or adults with kids not in the target range		Adult with children age 8 to 12		p-value	
Statement	Mean	SD	SD	SD	SD	SD	SD		
the heart rate arena activity relates to the research taking place in the lab (n= 301)	6.01	1.08	5.96	1.15	6.03	1.10	6.04	1.01	.853
the stretching activity relates to the research taking place in the lab (n= 289)	5.81	1.18	5.76	1.21	5.73	1.22	5.92	1.12	.470
the strength activity relates to the research taking place in the lab (n= 286)	5.75	1.23	5.83	1.28	5.78	1.27	5.66	1.16	.601
the touch screens reporting results relates to the research taking place in the lab (n= 264)	5.54	1.59	5.56	1.28	5.48	1.74	5.56	1.34	.934

Note: items displayed in descending order of total mean score

Participants assigned importance to the health messages being put forth by the various *Labs in Life* components. Participants felt moderately to strongly positive that the activities in *Labs in Life* had an important health message. Table 12 displays the mean and standard deviation for each of the items measuring importance of health message. The Heart Rate Arena activity had a very strongly positive mean (Mean= 6.67; SD= 0.69) followed by the Strength activity (Mean = 6.28; SD= 1.07), and the lab area (Mean= 6.22; SD= 1.09). The Flexibility activity had the lowest mean among the items both total (Mean= 6.01; SD= 1.23) and between groups. The Heart Rate Arena activity had a low standard deviation, below 1.00, overall and for each group, suggesting rather uniform high levels of agreement



among all participants that the heart rate arena activity had an important health message.

The findings that adults with children ages eight to 12 in their groups rated each of the items in Table 12, with the exception of the touch screen item, significantly higher than teenage participants suggests that these differences exist between these groups within the population of COSI visitors. Differences between groups were significant for each of the following items:

- *The heart rate arena had an important health message* $F(2)= 4.85, p= .009$
- *The stretching activity had an important health message* $F(2)= 5.11, p= .007$
- *The stretching activity had an important health message* $F(2)=4.45, p=.012$
- *The OSU research lab had an important health message* $F(2)= 3.96, p=.020$

Teenage participants had the lowest mean score for each item measuring the importance of the health message of the components of *Labs in Life*. Post hoc analysis (Bonferonni) indicated that for each of these items with significant differences between groups, the teenager group means were significantly lower than adults with children age eight to 12 group means. These findings suggest that teenage visitors to *Labs in Life* attribute a lower level of importance to the health messages of the various components in *Labs in Life* when compared with adults with a child age eight to 12 visiting with them. The findings also suggest that while the level of importance is strongly positive for each of the items, participants assigned a higher level of importance to the message of the Heart Rate Arena.

Table 12: Activities had an important health message, mean and standard deviation total and by group type

	Total	Teenager age 13 to 18		Adult only or adults with kids not in the target range		Adult with children age 8 to 12		p-value	
Statement	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
the heart rate arena activity had an important health message (n= 298)	6.67	0.69	6.52	0.88	6.67	0.70	6.81	0.69	.009
the strength activity had an important health message (n= 302)	6.28	1.07	6.11	1.19	6.17	1.12	6.50	0.88	.012
the OSU research lab had an important health message (n= 297)	6.22	1.09	6.02	1.20	6.18	1.05	6.43	0.97	.020
the touch screens reporting results had an important health message (n= 253)	6.04	1.36	6.02	1.28	5.94	1.40	6.11	1.40	.726
the stretching activity had an important health message (n= 305)	6.01	1.23	5.81	1.26	5.88	1.29	6.30	1.10	.007

Note: items displayed in descending order of total mean score.

Participants were slightly positive in their responses to the items measuring their perceptions of whether they had learned an important health science component from each of the activities. Table 13 displays the mean and standard deviation for each item total and by group type. Supporting the higher means found in the previously reported items, the Heart Rate Arena was again given the highest mean score overall (Mean= 5.41; SD= 1.27) and by group type. It is interesting when compared with the prior results that the touch screens were given the second highest mean score overall (Mean= 4.90; SD= 1.76). As discussed later this finding is attributed to a boost in scores given by participants after the Nutrition kiosk was installed. The Strength activity was given the third highest total mean score by



participants (Mean= 4.78; SD= 1.50). The lab was given the lowest total mean score for these items (Mean= 4.70; SD= 1.48). In general the standard deviations for these items total and by group are higher than the other items reported in this study reflecting the lower means. This suggests that participants had greater range in differences in their responses to these items; that some participants felt they learned more or less than the mean score suggests.

Examining the differences in mean between groups indicates that significant differences between groups exist for the item *the heart rate arena activity taught me an important health science component* $F(2)= 3.27, p= .039$. Post hoc analysis (Bonferonni) revealed that adults with children age eight to 12 in their groups rated this item significantly higher than teenagers.

Table 13: Activities taught me an important health science component, mean and standard deviation total and by group type

Statement	Total		Teenager age 13 to 18		Adult only or adults with kids not in the target range		Adult with children age 8 to 12		p-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
the heart rate arena activity taught me an important health science component (n= 298)	5.41	1.27	5.20	1.42	5.39	1.23	5.64	1.11	.039
the touch screens reporting results taught me an important health science component (n= 249)	4.90	1.76	4.91	1.64	4.59	1.86	5.09	1.79	.203
the strength activity taught me an important health science component (n= 298)	4.78	1.50	4.82	1.49	4.60	1.69	4.86	1.38	.466
the stretching activity taught me an important health science component (n= 301)	4.73	1.58	4.71	1.56	4.54	1.65	4.90	1.54	.273
the OSU research lab taught me an important health science component (n= 293)	4.70	1.48	4.69	1.50	4.59	1.51	4.79	1.45	.649

Note: items displayed in descending order of total mean score.

Touch screens: Pre-Nutrition installation compared to post-Nutrition installation

As noted in the introduction of this report, the content of the touch screen kiosks located in *Labs in Life* changed as the evaluation data were being collected. Initially, the two kiosks were set up to allow participants to record their performance information from the different activity stations. Once this was done, participants were able to view a screen comparing their performance on the various activities with other COSI guests' performance and national averages. After the installation of Nutrition, one of the kiosks was dedicated to allowing participants to build a plate of food, attempting to fall within government health guidelines.

Only the questionnaire data were still being collected after the installation of the Nutrition station. Examining the questionnaire items focusing on the touch screen kiosks reveals a notable shift towards



higher (more positive) mean scores and much lower standard deviations for each of the items measuring the touch screens. As displayed in Table 14 the mean score for each touch screen item was significantly higher post-Nutrition installation for each of the following items:

- *It made sense to me why the touch screens reporting results were located in Labs in Life, $t(260) = -8.83, p = .000$*
- *The touch screens reporting results had an important health message $t(251) = -8.23, p = .000$*
- *The touch screens reporting results taught me an important health science component $t(247) = -9.37, p = .000$*
- *The touch screens reporting results relates to the research taking place in the lab $t(262) = -9.18, p = .000$.*

Table 14: Touch screen items mean and standard deviation: Pre-Nutrition installation compared to Post-Nutrition installation

Statement	Pre-nutrition screen installation (n= 150)		Post-nutrition screen installation (n=112)		p-value
	Mean	SD	Mean	SD	
It made sense to me why the touch screens reporting results were located in Labs in Life	5.49	1.47	6.66	0.81	.000
The touch screens reporting results had an important health message	5.52	1.57	6.69	0.76	.000
The touch screens reporting results taught me an important health science component	4.10	1.74	5.87	1.22	.000
The touch screens reporting results relates to the research taking place in the lab	4.91	1.67	6.39	0.93	0.00

Note: items displayed in descending order of mean

Conclusions

The findings presented in this report provide insight into the connections visitors to COSI make between the various components of *Labs in Life*, as well as the connection visitors make between the components and the research taking place in the lab. These findings are supported through the use of multiple methods to collect the data used to inform this report.

The specific conclusions for the summative study are presented below. In general, it was found that visitors engaged with, and made meaning from the activities in *Labs in Life*. There is a general sense of connection among the activities and to the laboratories themselves. The findings of the study suggest that the *Labs in Life* project is successful in achieving its in-museum experience outcomes.

To what degree and in what ways do visitors, especially members of the two target audiences, make connections between and among activities?

Participants make a high degree of connections between and among the activities in the *Labs in Life* exhibit. This is done primarily through engagement with the different activities, discussion with other group members while engaging in the activities, and observation of other group members who are engaging in the activities. Data collected through observation reflect that visitors to *Labs in Life* tend to engage in the activity found with each component, and that visitors engage in multiple activities.



Examining engagement by individual component suggests that for Heart Rate Arena, Strength, and Flexibility activities, both children and adults in intergenerational groups are very likely to engage in the activity over all other observed behaviors. There were some notable differences in behaviors between group types; children only groups were less likely to observe another group member engaging in activity than those in intergenerational groups. Participants frequently engaged in conversation while engaged in an activity with about half of the observed intergenerational and half of the observed children only groups discussing the content of the activity they were engaged in. Observational data also supports that visitors tend to engage in multiple activities in *Labs in Life* strengthening the possibility that connections are made between the different components of the exhibit.

Interview participants were able to articulate a range of basic health messages that they felt tied the different components together. These messages were influenced by the components participants engaged in and do reflect that participants were making a connection between the health messages and the components of *Labs in Life*. Participants who completed the questionnaire reflected moderate to high levels of positive agreement with statements that it “made sense” why each of the different components were located in *Labs in Life*. These data suggest that while visitors may not completely agree on the specific messages they receive from the exhibit, they are aware that these are related to health and that the extent and topic of the messages received is most likely influenced by the number and topic of the activities visitors engage in.

To what degree and in what ways do visitors, especially in the target audiences, make connections between the activities and the research being conducted in the Labs? Are there potential variables that might explain differences, if any, in conditions?

Interview participants reflected a high level of awareness that the research lab is present and that research is taking place in *Labs in Life*. These participants were asked what research they thought was taking place in the lab; the top three responses coded were participants mentioning specific machines on display in the lab (n= 18), that the research was about exercise (n= 12), and that the lab was “testing” people’s abilities (n= 12). Teens were more likely than either of the other groups to note the presence of the Wii video game system research taking place, as this was tied for their top coded response. As would be expected, participants’ response to what is taking place in the lab is influenced by what is visible in the lab. Lab equipment or machines are highly visible even when no one is in the lab using them and therefore these machines tell the visitors stories about what is taking place in the lab.

Participants in the questionnaire portion of the study had moderate positive levels of agreement that each of the components of *Labs in Life* relate back to the research taking place in the lab with each item having an overall mean of 5.54 or higher. This suggests visitors do feel that each of the components within the Labs in Life exhibit space relates back to the research taking place in the lab.

A number of potential variables that would explain the differences in participants’ connections between the activities and the research being conducted were explored. Interview participants were asked to rate how appropriate they felt each of the activities were for different age groups. In general the rating of appropriateness for each activity increased as the age groups increased. This was consistent across the groups of participants. This suggest that visitor age is a variable that would explain differences in the connections that visitors are able to make between the activities and the research, and that participants in this study identify that the activities are less appropriate for those age two to five years old or six to seven years old than those who are in older age groups.



The importance of the health message was examined as a potential variable that might explain differences in the connections made by the different target audiences. It was found that teenage participants had the lowest mean score for each of the items measuring the importance of the health message of the different activities, significantly lower than adults with children age eight to 12 in their groups for four of the activities, which may suggest that teenage visitors are less likely to make connecting between the activities and the research taking place due to placing less importance on these topics.

Participants were slightly positive in their responses to the items measuring their perceptions of whether they had learned an important health science component from each of the activities. Again teenagers mean for the heart rate activity was significantly lower than adults with children age eight to 12 in their groups. The findings of significant difference between means for items suggests that teenage visitors to COSI might make lower connections between the activities and be less receptive to the messages being put forth by the activities than adults who are part of an intergenerational group containing an eight to 12 year old.

