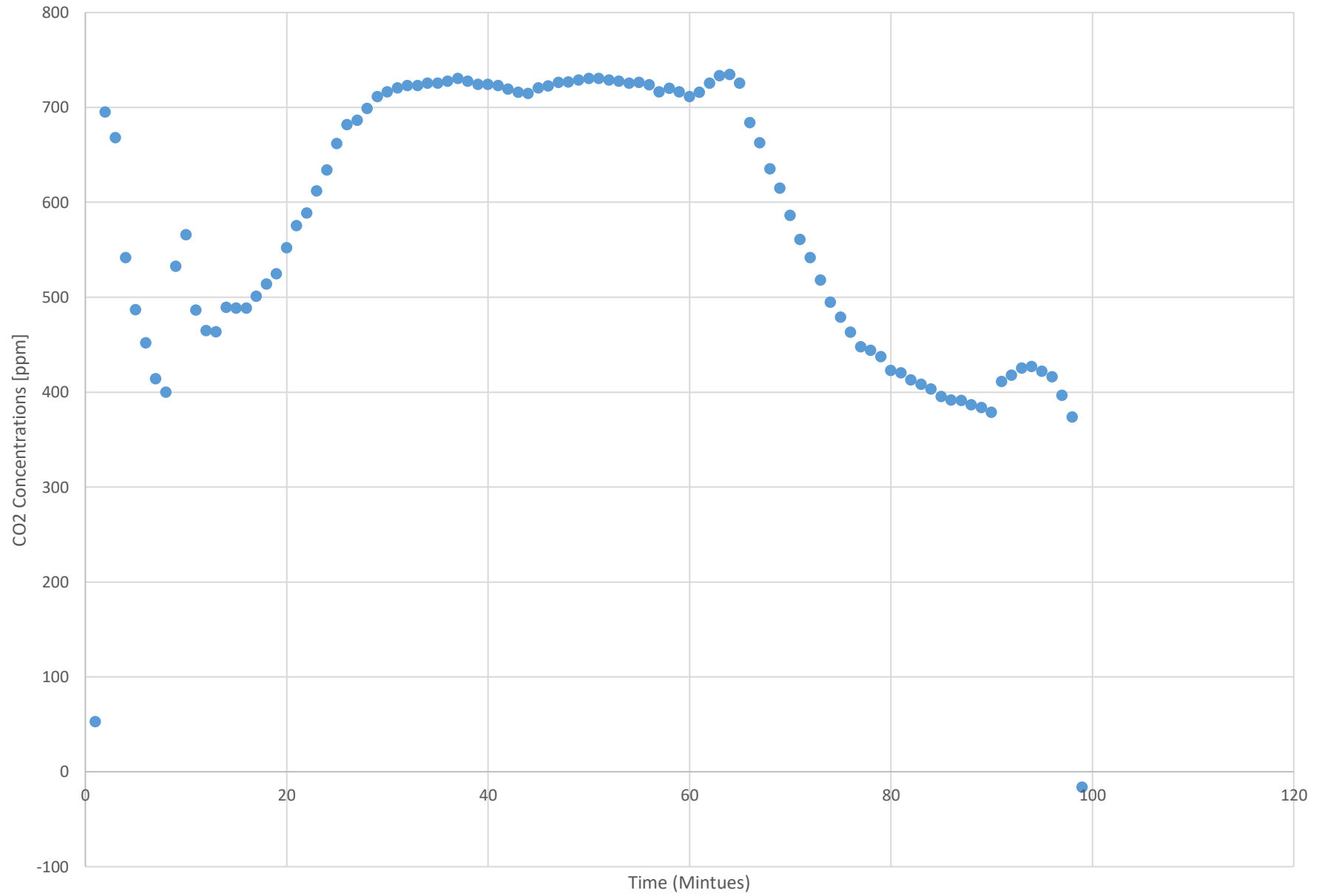


## Study Room



Sarah Parr
ENGR 115
8:00-11:50
10/21/2016

**Input Parameters:**

Mesured Coutdoor[ppm]		553.7
Assumed Coutdoor[ppm]		400
Correction Factor [ppm]		-153.7

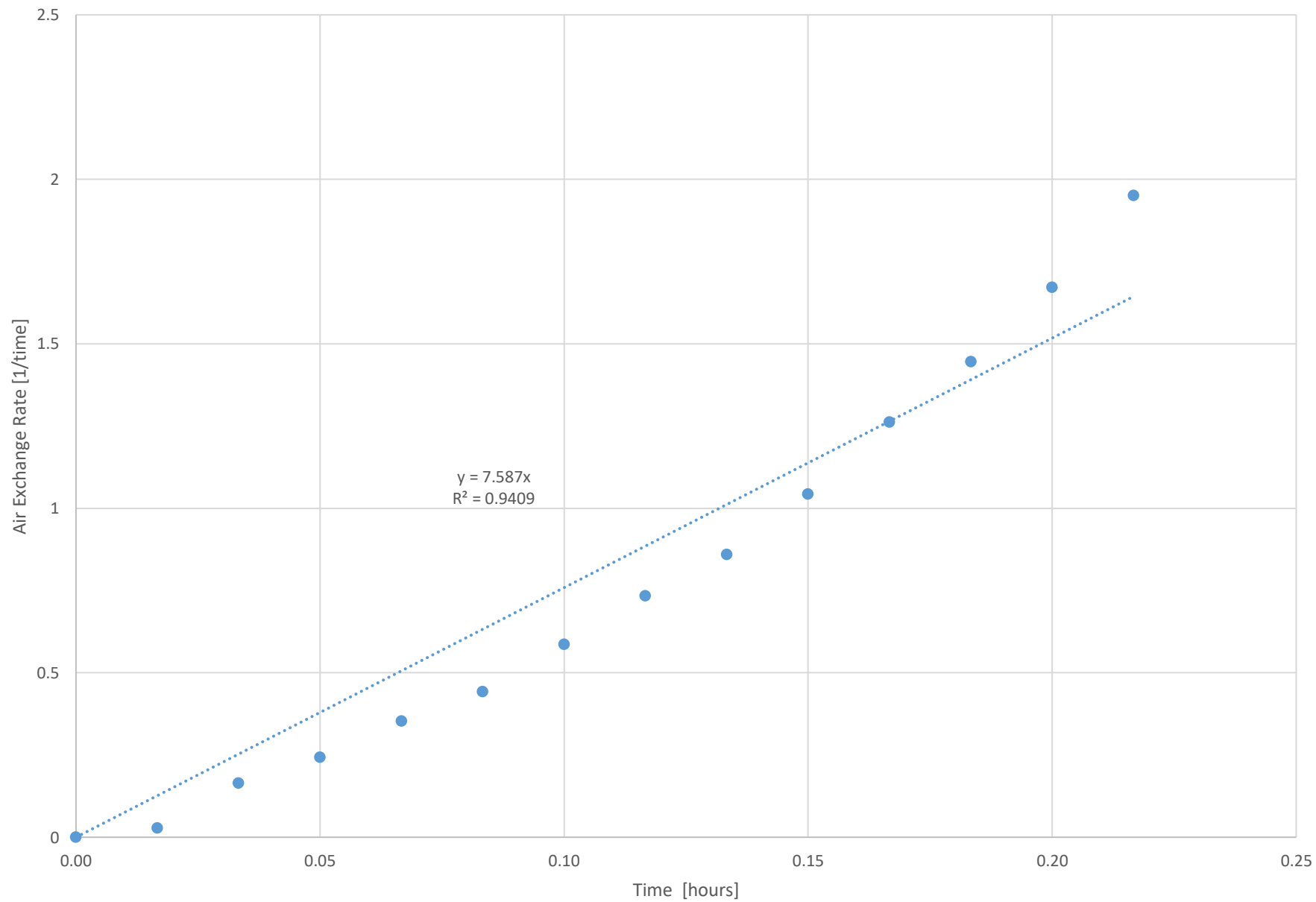
**Plot Title: Study Room**

Measurment	Date Time, GMT-07:	HOBO CO2 Concentrations	Actual CO2 Concentrations
1	10/21/2016 8:48	206.3	52.6
2	10/21/2016 8:49	848.6	694.9
3	10/21/2016 8:50	821.7	668
4	10/21/2016 8:51	695.4	541.7
5	10/21/2016 8:52	640.4	486.7
6	10/21/2016 8:53	605.6	451.9
7	10/21/2016 8:54	567.8	414.1
8	10/21/2016 8:55	553.7	400
9	10/21/2016 8:56	686.2	532.5
10	10/21/2016 8:57	719.2	565.5
11	10/21/2016 8:58	639.8	486.1
12	10/21/2016 8:59	618.4	464.7
13	10/21/2016 9:00	617.2	463.5
14	10/21/2016 9:01	642.9	489.2
15	10/21/2016 9:02	642.2	488.5
16	10/21/2016 9:03	642.2	488.5
17	10/21/2016 9:04	654.5	500.8
18	10/21/2016 9:05	667.3	513.6
19	10/21/2016 9:06	678.3	524.6
20	10/21/2016 9:07	705.7	552
21	10/21/2016 9:08	728.9	575.2
22	10/21/2016 9:09	742.4	588.7
23	10/21/2016 9:10	765.6	611.9
24	10/21/2016 9:11	787.5	633.8
25	10/21/2016 9:12	815.6	661.9
26	10/21/2016 9:13	835.2	681.5
27	10/21/2016 9:14	840	686.3
28	10/21/2016 9:15	852.3	698.6
29	10/21/2016 9:16	865.1	711.4
30	10/21/2016 9:17	870	716.3
31	10/21/2016 9:18	874.2	720.5
32	10/21/2016 9:19	876.7	723
33	10/21/2016 9:20	876.7	723
34	10/21/2016 9:21	879.1	725.4
35	10/21/2016 9:22	879.1	725.4

36	10/21/2016 9:23	881	727.3
37	10/21/2016 9:24	884	730.3
38	10/21/2016 9:25	881	727.3
39	10/21/2016 9:26	877.9	724.2
40	10/21/2016 9:27	877.9	724.2
41	10/21/2016 9:28	876.7	723
42	10/21/2016 9:29	873	719.3
43	10/21/2016 9:30	869.4	715.7
44	10/21/2016 9:31	868.1	714.4
45	10/21/2016 9:32	874.2	720.5
46	10/21/2016 9:33	876.1	722.4
47	10/21/2016 9:34	879.7	726
48	10/21/2016 9:35	880.3	726.6
49	10/21/2016 9:36	882.2	728.5
50	10/21/2016 9:37	884	730.3
51	10/21/2016 9:38	884	730.3
52	10/21/2016 9:39	882.2	728.5
53	10/21/2016 9:40	881	727.3
54	10/21/2016 9:41	879.1	725.4
55	10/21/2016 9:42	879.7	726
56	10/21/2016 9:43	877.3	723.6
57	10/21/2016 9:44	870	716.3
58	10/21/2016 9:45	873.6	719.9
59	10/21/2016 9:46	870	716.3
60	10/21/2016 9:47	865.1	711.4
61	10/21/2016 9:48	869.4	715.7
62	10/21/2016 9:49	879.1	725.4
63	10/21/2016 9:50	887.1	733.4
64	10/21/2016 9:51	888.3	734.6
65	10/21/2016 9:52	879.1	725.4
66	10/21/2016 9:53	837.6	683.9
67	10/21/2016 9:54	816.2	662.5
68	10/21/2016 9:55	788.8	635.1
69	10/21/2016 9:56	768.6	614.9
70	10/21/2016 9:57	739.9	586.2
71	10/21/2016 9:58	714.3	560.6
72	10/21/2016 9:59	695.4	541.7
73	10/21/2016 10:00	671.6	517.9
74	10/21/2016 10:01	648.4	494.7
75	10/21/2016 10:02	632.5	478.8
76	10/21/2016 10:03	616.6	462.9
77	10/21/2016 10:04	601.3	447.6
78	10/21/2016 10:05	597.7	444
79	10/21/2016 10:06	591	437.3
80	10/21/2016 10:07	576.3	422.6
81	10/21/2016 10:08	573.9	420.2
82	10/21/2016 10:09	566.5	412.8

83	10/21/2016 10:10	561.7	408
84	10/21/2016 10:11	556.8	403.1
85	10/21/2016 10:12	548.8	395.1
86	10/21/2016 10:13	545.2	391.5
87	10/21/2016 10:14	544.6	390.9
88	10/21/2016 10:15	540.3	386.6
89	10/21/2016 10:16	537.2	383.5
90	10/21/2016 10:17	532.4	378.7
91	10/21/2016 10:18	564.7	411
92	10/21/2016 10:19	571.4	417.7
93	10/21/2016 10:20	578.8	425.1
94	10/21/2016 10:21	580.6	426.9
95	10/21/2016 10:22	575.7	422
96	10/21/2016 10:23	569.6	415.9
97	10/21/2016 10:24	550.1	396.4
98	10/21/2016 10:25	527.5	373.8
99	10/21/2016 10:26	137.4	-16.3

Chart Title



Sarah Parr
ENGR 115
8:00-11:50
10/21/2016

<b>Input Parameters:</b>	
Mesured Coutdoor[ppm]	553.7
Assumed Coutdoor[ppm]	400
Correction Factor [ppm]	-153.7
Room volume [ft^3]	1080
Room capacity [People]	5

<b>Calculations:</b>	
Air Exchange Rate[1/hr]	7.587
Time to remove non-reactive chemical	0.13
Ventalation rate [ft^3/min/person]	27.3132

<b>Analysis:</b>		
Measurments	Date Time, GMT-07:00	HOBO CO2 Concentrations
0	9:51	888.3
1	9:52	879.1
2	9:53	837.6
3	9:54	816.2
4	9:55	788.8
5	9:56	768.6
6	9:57	739.9
7	9:58	714.3
8	9:59	695.4
9	10:00	671.6
10	10:01	648.4
11	10:02	632.5
12	10:03	616.6
13	10:04	601.3

Actual CO2 Concentrations	Expimiment time (Hrs)	$\ln((C_{room}(t)-C_{outdoor})/(C_o-C_{outdoor}))$
734.6	0.00	0
725.4	0.02	0.027880594
683.9	0.03	0.164313725
662.5	0.05	0.242684707
635.1	0.07	0.352924833
614.9	0.08	0.442762985
586.2	0.10	0.586114424
560.6	0.12	0.734018987
541.7	0.13	0.859223642
517.9	0.15	1.043098981
494.7	0.17	1.262221788
478.8	0.18	1.446022792
462.9	0.20	1.671389625
447.6	0.22	1.950103027

1. What is the air exchange rate ( $\lambda$ ) of the room you tested? Be sure to include the units for the air exchange rate in your answer.

2. In general it takes  $3/\lambda$  hours to remove a non-reactive chemical from indoor air. Based on this time, what recommendations would you make to the occupants of the room?

3. Compare your ventilation rate for a typical number of occupants to the ASHRAE recommended ventilation rate. Based on this comparison, are the occupants wasting energy heating and cooling the air or are the occupants being too cheap and not supplying enough air? Justify your answer.

4. Given the ASHRAE standard ventilation standard, what is the maximum number of people you would recommend having in this room at one time? Use your model to determine this number.



Our air exchange rate is 7.587/hour.

Our room was very well ventilated, even with the doors closed. Based on our findings, the occupants of that room will be okay to stay in there for an extended amount of time.

The standard for a small enclosed room is 0.33/hour. This room is very well ventilated but only because it is connected to the entire ventilation system of the library. If they were ventilation for only that particular room, then they would be wasting energy heating and cooling. But because it is for the massive population that comes through the library, the energy consumption is justified. however, proper tests would need to be done to prove my theory.

Using the Air exchange rate analysis chart, and by changing the population of my room, I was able to see how the ventilation rate went down as the population went up. The ventilation rate for a room measured at about 1000 ft<sup>3</sup> was 7 people, with 20 cfm per person. I got around 20 cfms as well, so we can safely say that 7 people can stay in that room for an extended period of time.