Data Report 9
Course Drain

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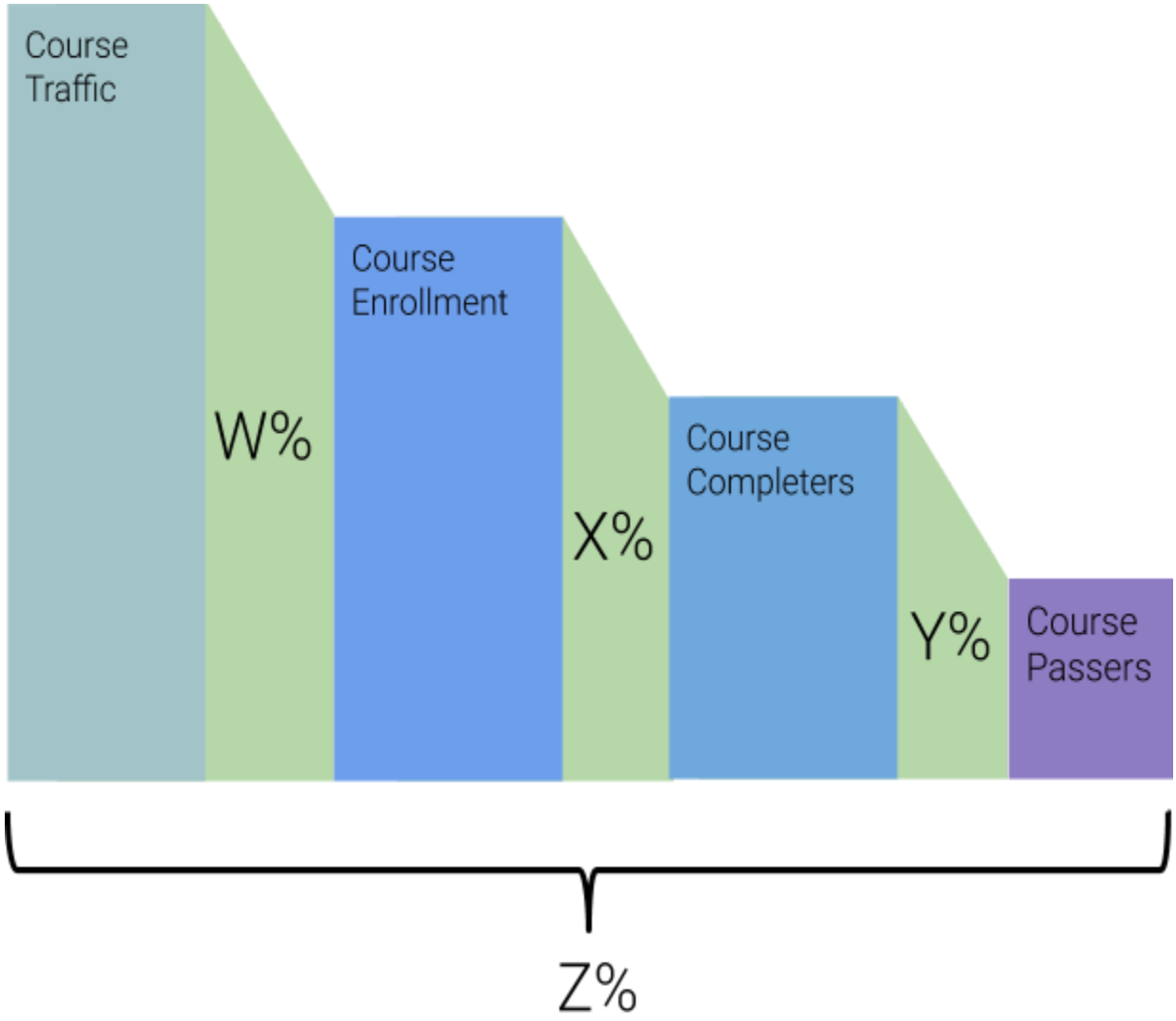
SUMMARY

This report investigates the ‘drain’ of users from individual courses based on the following metrics and their ratios in comparison with one another: traffic, enrollment, attempts (of the final), and passes (of the final). Understanding the drain of specific courses will allow us to identify the most and least successful courses in terms of user retention, as well as specific bottlenecks in courses.

INTRODUCTION

In Data Report 6, I investigated bottlenecks related to courses overall. In this report, I want to look specifically at the retention of users throughout each course. That is to say, I want find the following percentages or ratios:



where W represents retention of traffic into enrollments, X represents retention of enrollments into attempters (those who attempt the final exam), Y represents retention of attempters into passers (those who receive a passing grade on the final), and Z represents retention of a course overall.

SAMPLE

The aim of this report is to investigate retention in a course during a period of business as usual. Therefore, I exclude very noisy events that would affect the retention percentages. In particular, for each course, I look at the most recent three-month period that satisfies the following criteria: 1) It avoids the November superspike and 2) it avoids any course-specific advertisements. The first criterion means the most recent period for any course is ending in October 2017. The second criterion is course specific given that we advertise different courses at different times. Altogether, these criteria lead to the following timeframes for the courses:

Table 1: Chosen Timeframes for Courses

Course	Timeframe
ARTH101, BIO307, BUS101, BUS103, BUS105, BUS203, BUS204, BUS205, BUS210, BUS301, BUS305, BUS401, BUS402, BUS403, BUS501, CHEM101, COMM001, COMM101, COMM411, CS101, CS102, CS201, CS202, CS301, CS302, CS303, CS304, CS401, CS402, CS403, CS404, CS405, CS406, CS408, CS409, CS410, CS412, CUST104, CUST105, ECON101, ECON102, ECON201, ECON202, ENGL000, ENGL001, ENGL002, ENGL210, ENGL405, ENVS203, HIST103, HIST362, K12MATH013, K12MATH014, MA001, MA005, MA121, PHIL304, POLSC101, POLSC201, POLSC221, POLSC232, POLSC401, POLSC402, PRDV003, PRDV005, PRDV102, PRDV103, PRDV104, PRDV251, PRSM107, RWM101, RWM102, Saylor001, SOC101, Try College 101	August to October 2017
BUS202, BUS209, BUS303, PHIL103, PHYS101, PHYS102, RWM103,	July to September 2017
BIO101, BUS206, BUS300, MA101, PSYCH101, SALES103	June to August 2017
BUS208, CS107, CS305, ECON307, HIST363, MA111, PRDV002, PRDV004	May to July 2017

METHOD

I'll begin with presenting the raw numbers corresponding to traffic (pageviews - PV), enrollment (enrollments - Enroll), attempts (attempting the course final - Attempt), and course completions (passing course - Pass).

Table 2: Raw Engagement Numbers for Courses

Course	PV	Enroll	Attempt	Pass
ARTH101: Art Appreciation and Techniques	8135	188	18	3
BIO101: Introduction to Molecular and Cellular Biology	11422	277	48	19
BIO307: Microbiology	4535	170	23	6
BUS101: Introduction to Business	26001	812	98	35
BUS103: Introduction to Financial Accounting	11327	353	48	18
BUS105: Managerial Accounting	5092	161	24	6
BUS202: Principles of Finance	4791	100	20	10
BUS203: Principles of Marketing	8089	277	59	28
BUS204: Business Statistics	4133	152	20	5
BUS205: Business Law and Ethics	7380	231	61	37
BUS206: Management Information Systems	10103	530	452	280
BUS208: Principles of Management	7080	158	48	22
BUS209: Organizational Behavior	2902	54	8	4
BUS210: Corporate Communication	3837	130	35	14
BUS300: Operations Management	2540	61	7	2
BUS301: Human Resource Management	5865	177	41	16
BUS303: Strategic Information Technology	1174	52	15	3
BUS305: Small Business Management	2392	64	18	5
BUS401: Management Leadership	2549	82	11	5
BUS402: Project Management	5505	72	21	7
BUS403: Negotiations and Conflict Management	2771	229	88	30
BUS501: Strategic Management	2767	88	22	7
CHEM101: General Chemistry I	9846	307	32	9
COMM001: Principles Of Human Communication	10833	92	13	2
COMM101: Public Speaking	6149	160	23	2
COMM411: Public Relations	3638	142	44	26

CS101: Introduction to Computer Science I	35160	1071	183	108
CS102: Introduction to Computer Science II	5629	112	13	3
CS107: C++ Programming	13141	126	20	6
CS201: Elementary Data Structures	3222	81	10	6
CS202: Discrete Structures	2740	74	5	3
CS301: Computer Architecture	5126	235	141	69
CS302: Software Engineering	8322	300	174	87
CS303: Algorithms	3407	76	3	2
CS304: Compilers	1886	67	37	21
CS305: Web Development	7344	140	27	10
CS401: Operating Systems	5246	177	83	40
CS402: Computer Communications and Networks	4648	181	63	18
CS403: Introduction to Modern Database Systems	2933	141	71	51
CS404: Programming Languages	2119	47	2	0
CS405: Artificial Intelligence	2350	88	4	0
CS406: Information Security	2810	108	36	14
CS408: Advanced Artificial Intelligence	796	28	1	0
CS409: Cryptography	1363	55	13	8
CS410: Advanced Databases	4533	274	228	89
CS412: Mobile Application Development	2554	80	9	3
CUST104: Business Communications	6705	197	60	24
CUST105: Customer Service	3206	110	39	32
ECON101: Principles of Microeconomics	13259	340	66	32
ECON102: Principles of Macroeconomics	5342	172	37	22
ECON201: Intermediate Microeconomics	1987	46	7	1
ECON202: Intermediate Macroeconomics	1549	34	1	1
ECON307: International Trade	1657	23	9	0
ENGL000: Pre-College English	24408	740	62	7
ENGL001: English Composition I	12422	359	30	5
ENGL002: English Composition II	3489	96	17	5
ENGL210: Technical Writing	5539	170	3	3
ENGL405: The American Renaissance	2090	44	6	1
ENVS203: Environmental Ethics, Justice, and World Views	4248	134	31	10

HIST103: World History in the Early Modern and Modern	6777	203	17	5
HIST362: Modern Revolutions	2071	43	11	1
HIST363: Global Perspectives on Industrialization	1185	23	8	1
K12MATH013: Calculus AB	4397	77	11	0
K12MATH014: Advanced Statistics	2187	61	6	1
MA001: College Algebra	14519	503	113	76
MA005: Calculus 1	4866	135	14	2
MA101: Single-Variable Calculus I	1639	33	0	0
MA111: Introduction to Mathematical Reasoning	2047	33	4	2
MA121: Introduction to Statistics	11383	275	26	10
PHIL103: Moral and Political Philosophy	2853	84	9	2
PHIL304: Existentialism	2034	63	5	5
PHYS101: Introduction to Mechanics	6282	177	13	7
PHYS102: Introduction to Electromagnetism	2019	47	3	0
POLSC101: Introduction to Political Science	15579	262	25	9
POLSC201: Introduction to Western Political Thought	2238	66	10	0
POLSC221: Introduction to Comparative Politics	3534	90	19	8
POLSC232: American Government	3212	61	12	5
POLSC401: Ethics and Public Policy	1626	44	18	6
POLSC402: Global Justice	1278	34	9	6
PRDV002: Professional Writing	4062	122	40	27
PRDV003: Word Processing Using Microsoft Word	2692	107	57	25
PRDV004: Spreadsheets	2401	81	38	26
PRDV005: Time and Stress Management	4272	184	93	42
PRDV102: Resume Writing	3053	98	36	9
PRDV103: Interviewing Skills	2406	123	66	23
PRDV104: Professional Etiquette	5093	325	259	218
PRDV251: HTML and CSS for Beginners	1880	78	4	1
PRSM107: Crisis Communication	1070	40	9	3
PSYCH101: Introduction to Psychology	13335	307	34	18
RWM101: Foundations of Real World Math	4963	115	26	7
RWM102: Algebra	6876	72	13	6
RWM103: Geometry	2792	68	12	6
SALES103: Public Speaking for Sales	1252	43	10	2

Saylor001: Introduction to Learning on Saylor Academy	4370	112	65	61
SOC101: Introduction to Sociology	8227	242	34	6
Try College 101	7869	201	19	10

To better compare the courses, we can create a ratio for the first three metrics to 1 pass (i.e., divide PV, enroll, and attempt by the number of passes for each course). For example, to get 1 passing student in ARTH101, you would, on average, need 6.0 attempters, 62.7 enrollers, and 2711.7 page views (note that a person can view a page multiple times). The lower the number in the column, the less "drain" there is in comparison to passers.

Table 3: Ratio Engagement Numbers for All Courses

Course	PV	Enroll	Attempt	Pass
ARTH101: Art Appreciation and Techniques	2711.7	62.7	6.0	1.0
BIO101: Introduction to Molecular and Cellular Biology	601.2	14.6	2.5	1.0
BIO307: Microbiology	755.8	28.3	3.8	1.0
BUS101: Introduction to Business	742.9	23.2	2.8	1.0
BUS103: Introduction to Financial Accounting	629.3	19.6	2.7	1.0
BUS105: Managerial Accounting	848.7	26.8	4.0	1.0
BUS202: Principles of Finance	479.1	10.0	2.0	1.0
BUS203: Principles of Marketing	288.9	9.9	2.1	1.0
BUS204: Business Statistics	826.6	30.4	4.0	1.0
BUS205: Business Law and Ethics	199.5	6.2	1.6	1.0
BUS206: Management Information Systems	36.1	1.9	1.6	1.0
BUS208: Principles of Management	321.8	7.2	2.2	1.0
BUS209: Organizational Behavior	725.5	13.5	2.0	1.0
BUS210: Corporate Communication	274.1	9.3	2.5	1.0
BUS300: Operations Management	1270.0	30.5	3.5	1.0
BUS301: Human Resource Management	366.6	11.1	2.6	1.0
BUS303: Strategic Information Technology	391.3	17.3	5.0	1.0
BUS305: Small Business Management	478.4	12.8	3.6	1.0
BUS401: Management Leadership	509.8	16.4	2.2	1.0
BUS402: Project Management	786.4	10.3	3.0	1.0
BUS403: Negotiations and Conflict Management	92.4	7.6	2.9	1.0
BUS501: Strategic Management	395.3	12.6	3.1	1.0
CHEM101: General Chemistry I	1094.0	34.1	3.6	1.0

COMM001: Principles Of Human Communication	5416.5	46.0	6.5	1.0
COMM101: Public Speaking	3074.5	80.0	11.5	1.0
COMM411: Public Relations	139.9	5.5	1.7	1.0
CS101: Introduction to Computer Science I	325.6	9.9	1.7	1.0
CS102: Introduction to Computer Science II	1876.3	37.3	4.3	1.0
CS107: C++ Programming	2190.2	21.0	3.3	1.0
CS201: Elementary Data Structures	537.0	13.5	1.7	1.0
CS202: Discrete Structures	913.3	24.7	1.7	1.0
CS301: Computer Architecture	74.3	3.4	2.0	1.0
CS302: Software Engineering	95.7	3.4	2.0	1.0
CS303: Algorithms	1703.5	38.0	1.5	1.0
CS304: Compilers	89.8	3.2	1.8	1.0
CS305: Web Development	734.4	14.0	2.7	1.0
CS401: Operating Systems	131.2	4.4	2.1	1.0
CS402: Computer Communications and Networks	258.2	10.1	3.5	1.0
CS403: Introduction to Modern Database Systems	57.5	2.8	1.4	1.0
CS404: Programming Languages	*			
CS405: Artificial Intelligence				
CS406: Information Security	200.7	7.7	2.6	1.0
CS408: Advanced Artificial Intelligence				
CS409: Cryptography	170.4	6.9	1.6	1.0
CS410: Advanced Databases	50.9	3.1	2.6	1.0
CS412: Mobile Application Development	851.3	26.7	3.0	1.0
CUST104: Business Communications	279.4	8.2	2.5	1.0
CUST105: Customer Service	100.2	3.4	1.2	1.0
ECON101: Principles of Microeconomics	414.3	10.6	2.1	1.0
ECON102: Principles of Macroeconomics	242.8	7.8	1.7	1.0
ECON201: Intermediate Microeconomics	1987.0	46.0	7.0	1.0
ECON202: Intermediate Macroeconomics	1549.0	34.0	1.0	1.0
ECON307: International Trade				
ENGL000: Pre-College English	3486.9	105.7	8.9	1.0
ENGL001: English Composition I	2484.4	71.8	6.0	1.0
ENGL002: English Composition II	697.8	19.2	3.4	1.0
ENGL210: Technical Writing	1846.3	56.7	1.0	1.0

ENGL405: The American Renaissance	2090.0	44.0	6.0	1.0
ENVS203: Environmental Ethics, Justice, and World	424.8	13.4	3.1	1.0
HIST103: World History in the Early Modern and	1355.4	40.6	3.4	1.0
HIST362: Modern Revolutions	2071.0	43.0	11.0	1.0
HIST363: Global Perspectives on Industrialization	1185.0	23.0	8.0	1.0
K12MATH013: Calculus AB				
K12MATH014: Advanced Statistics	2187.0	61.0	6.0	1.0
MA001: College Algebra	191.0	6.6	1.5	1.0
MA005: Calculus 1	2433.0	67.5	7.0	1.0
MA101: Single-Variable Calculus I				
MA111: Introduction to Mathematical Reasoning	1023.5	16.5	2.0	1.0
MA121: Introduction to Statistics	1138.3	27.5	2.6	1.0
PHIL103: Moral and Political Philosophy	1426.5	42.0	4.5	1.0
PHIL304: Existentialism	406.8	12.6	1.0	1.0
PHYS101: Introduction to Mechanics	897.4	25.3	1.9	1.0
PHYS102: Introduction to Electromagnetism				
POLSC101: Introduction to Political Science	1731.0	29.1	2.8	1.0
POLSC201: Introduction to Western Political Thought				
POLSC221: Introduction to Comparative Politics	441.8	11.3	2.4	1.0
POLSC232: American Government	642.4	12.2	2.4	1.0
POLSC401: Ethics and Public Policy	271.0	7.3	3.0	1.0
POLSC402: Global Justice	213.0	5.7	1.5	1.0
PRDV002: Professional Writing	150.4	4.5	1.5	1.0
PRDV003: Word Processing Using Microsoft Word	107.7	4.3	2.3	1.0
PRDV004: Spreadsheets	92.3	3.1	1.5	1.0
PRDV005: Time and Stress Management	101.7	4.4	2.2	1.0
PRDV102: Resume Writing	339.2	10.9	4.0	1.0
PRDV103: Interviewing Skills	104.6	5.3	2.9	1.0
PRDV104: Professional Etiquette	23.4	1.5	1.2	1.0
PRDV251: HTML and CSS for Beginners	1880.0	78.0	4.0	1.0
PRSM107: Crisis Communication	356.7	13.3	3.0	1.0
PSYCH101: Introduction to Psychology	740.8	17.1	1.9	1.0
RWM101: Foundations of Real World Math	709.0	16.4	3.7	1.0
RWM102: Algebra	1146.0	12.0	2.2	1.0

RWM103: Geometry	465.3	11.3	2.0	1.0
SALES103: Public Speaking for Sales	626.0	21.5	5.0	1.0
Saylor001: Introduction to Learning on Saylor	71.6	1.8	1.1	1.0
SOC101: Introduction to Sociology	1371.2	40.3	5.7	1.0
Try College 101	786.9	20.1	1.9	1.0

*Note that some courses had 0 passes, so we cannot find the corresponding ratio numbers for those courses.

RESULTS

Table 4: Top Courses in Terms of Attempts to Passes

Course	PV	Enroll	Attempt	Pass
PHIL304: Existentialism	406.8	12.6	1.0	1.0
ECON202: Intermediate Macroeconomics	1549.0	34.0	1.0	1.0
ENGL210: Technical Writing	1846.3	56.7	1.0	1.0
Saylor001: Introduction to Learning on Saylor	71.6	1.8	1.1	1.0
PRDV104: Professional Etiquette	23.4	1.5	1.2	1.0
CUST105: Customer Service	100.2	3.4	1.2	1.0
CS403: Introduction to Modern Database Systems	57.5	2.8	1.4	1.0
PRDV004: Spreadsheets	92.3	3.1	1.5	1.0
PRDV002: Professional Writing	150.4	4.5	1.5	1.0
MA001: College Algebra	191.0	6.6	1.5	1.0

Table 5: Bottom Courses in Terms of Attempts to Passes

Course	PV	Enroll	Attempt	Pass
K12MATH014: Advanced Statistics	2187.0	61.0	6.0	1.0
ARTH101: Art Appreciation and Techniques	2711.7	62.7	6.0	1.0
ENGL001: English Composition I	2484.4	71.8	6.0	1.0
COMM001: Principles Of Human Communication	5416.5	46.0	6.5	1.0
ECON201: Intermediate Microeconomics	1987.0	46.0	7.0	1.0
MA005: Calculus 1	2433.0	67.5	7.0	1.0
HIST363: Global Perspectives on Industrialization	1185.0	23.0	8.0	1.0
ENGL000: Pre-College English	3486.9	105.7	8.9	1.0
HIST362: Modern Revolutions	2071.0	43.0	11.0	1.0

COMM101: Public Speaking	3074.5	80.0	11.5	1.0

Table 6: Top Courses in Terms of Enrollments to Passes

Course	PV	Enroll	Attempt	Pass
PRDV104: Professional Etiquette	23.4	1.5	1.2	1.0
Saylor001: Introduction to Learning on Saylor	71.6	1.8	1.1	1.0
BUS206: Management Information Systems	36.1	1.9	1.6	1.0
CS403: Introduction to Modern Database Systems	57.5	2.8	1.4	1.0
CS410: Advanced Databases	50.9	3.1	2.6	1.0
PRDV004: Spreadsheets	92.3	3.1	1.5	1.0
CS304: Compilers	89.8	3.2	1.8	1.0
CS301: Computer Architecture	74.3	3.4	2.0	1.0
CUST105: Customer Service	100.2	3.4	1.2	1.0
CS302: Software Engineering	95.7	3.4	2.0	1.0

Table 7: Bottom Courses in Terms of Enrollments to Passes

Course	PV	Enroll	Attempt	Pass
ECON201: Intermediate Microeconomics	1987.0	46.0	7.0	1.0
COMM001: Principles Of Human Communication	5416.5	46.0	6.5	1.0
ENGL210: Technical Writing	1846.3	56.7	1.0	1.0
K12MATH014: Advanced Statistics	2187.0	61.0	6.0	1.0
ARTH101: Art Appreciation and Techniques	2711.7	62.7	6.0	1.0
MA005: Calculus 1	2433.0	67.5	7.0	1.0
ENGL001: English Composition I	2484.4	71.8	6.0	1.0
PRDV251: HTML and CSS for Beginners	1880.0	78.0	4.0	1.0
COMM101: Public Speaking	3074.5	80.0	11.5	1.0
ENGL000: Pre-College English	3486.9	105.7	8.9	1.0

Table 8: Top Courses in Terms of Pageviews to Passes

Course	PV	Enroll	Attempt	Pass
PRDV104: Professional Etiquette	23.4	1.5	1.2	1.0
BUS206: Management Information Systems	36.1	1.9	1.6	1.0
CS410: Advanced Databases	50.9	3.1	2.6	1.0
CS403: Introduction to Modern Database Systems	57.5	2.8	1.4	1.0
Saylor001: Introduction to Learning on Saylor	71.6	1.8	1.1	1.0
CS301: Computer Architecture	74.3	3.4	2.0	1.0
CS304: Compilers	89.8	3.2	1.8	1.0
PRDV004: Spreadsheets	92.3	3.1	1.5	1.0
BUS403: Negotiations and Conflict Management	92.4	7.6	2.9	1.0
CS302: Software Engineering	95.7	3.4	2.0	1.0

Table 9: Bottom Courses in Terms of Pageviews to Passes

Course	PV	Enroll	Comp	Pass
HIST362: Modern Revolutions	2071.0	43.0	11.0	1.0
ENGL405: The American Renaissance	2090.0	44.0	6.0	1.0
K12MATH014: Advanced Statistics	2187.0	61.0	6.0	1.0
CS107: C++ Programming	2190.2	21.0	3.3	1.0
MA005: Calculus 1	2433.0	67.5	7.0	1.0
ENGL001: English Composition I	2484.4	71.8	6.0	1.0
ARTH101: Art Appreciation and Techniques	2711.7	62.7	6.0	1.0
COMM101: Public Speaking	3074.5	80.0	11.5	1.0
ENGL000: Pre-College English	3486.9	105.7	8.9	1.0
COMM001: Principles Of Human Communication	5416.5	46.0	6.5	1.0

Table 10: Courses Appearing in the Top 10 and/or Bottom 10 for the Analyzed Ratios

Course	PV:Pass	Enroll:Pass	Attempt:Pass
Saylor001: Introduction to Learning on Saylor			
PRDV104: Professional Etiquette			
CS403: Introduction to Modern Database			
BUS206: Management Information Systems			
CS410: Advanced Databases			
PRDV004: Spreadsheets			
PHIL304: Existentialism			
ECON202: Intermediate Macroeconomics			
CUST105: Customer Service			
CS304: Compilers			
CS301: Computer Architecture			
CS302: Software Engineering			
PRDV002: Professional Writing			
MA001: College Algebra			
BUS403: Negotiations and Conflict Management			
ENGL210: Technical Writing			
CS107: C++ Programming			
ENGL405: The American Renaissance			
PRDV251: HTML and CSS for Beginners			
ECON201: Intermediate Microeconomics			
HIST363: Global Perspectives on Industr.			
K12MATH014: Advanced Statistics			
HIST362: Modern Revolutions			
ARTH101: Art Appreciation and Techniques			
COMM001: Principles Of Human Comm			
ENGL001: English Composition I			
MA005: Calculus 1			
ENGL000: Pre-College English			
COMM101: Public Speaking			

CONCLUSION

The numbers in this report are fairly self-evident. You can use this information to assess courses as they are or to model new courses. In particular,

- Table 4 (Table 5) presents courses where students who attempt the final pass it often (infrequently).
    - A course being in Table 5 may mean that its final is either very easy or the curriculum is well designed for the student to pass the final (or vice versa). Note that this doesn't consider how many attempts a student took to complete the course.
- Table 6 (Table 7) presents courses where students who enroll in a course end up passing it often (infrequently).
    - A course being in Table 6 may mean that the course is short so students make it from beginning to end with fairly little effort or that the course curriculum is well designed to foster continued, meaningful engagement in the course.
- Table 8 (Table 9) presents courses where students who view the page end up passing the course often (infrequently).
    - A course being in Table 8 may mean that the general attractiveness of the course is high.

One can also use tables to find other important ratios for course design. For example, to determine the number of students needed to enroll in the course for 1 final attempt, simply divide the Enroll column by the Attempt column in Table 3.