Team #14

Purdue Libraries & SoET: Examining the Research and Writing Practices of Engineering Technology Students

Team Members: Maggie Needler, Hannah Parks, Damon German, Nolan Klutzke, Brenden Cooper, & Patrick Koehl
Mentors: Prof. Fred Berry
Clients: Prof. Margaret Phillips & Prof. Michael Fosmire

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Customer Background

The Purdue University Libraries and School of Information Studies system provides students with a variety of information and data services. Housed in WALC, seen below [1], Purdue Libraries is tasked with preparing Purdue Polytechnics' engineering technology students with information literacy skills needed in the workplace after graduation.

Problem Statement / Scope of Work

Our research objective was to propose a clear and well defined set of conclusions to aid Purdue University Engineering and Technology capstone students in their future success in the workplace. This was accomplished by identifying students' challenges in their current information literacy skills. One of the major challenges for Engineering and Technology students entering the workplace directly relates to perceived deficiencies in these skills; specifically, their difficulties with research efficacy. Our project deliverables served to provide Purdue Libraries with conclusions supported by data on how to better prepare these students for performing research within the workplace.

Requirements Matrix

The following are ranked in order of importance during our project development process:

- Choice of Data Collection Methods
- Obtaining IRB Approval
- Defining target demographics
- Operation of the project within budget
- Distinguishing of expected deliverables
- Schedule of weekly meetings with clients & mentor

Experimentation and Concepts

We utilized multiple methods of data collection to achieve our qualitative analysis, quantitative analysis, and overall conclusions used to develop our proposed solution. We began this process by surveying 65 TECH 120 students using the Self-Directed Information Literacy Scale (SIL) [2] to evaluate students' perceived research skills when picking an informational source. We then interviewed 3 students who completed this survey: giving them a research prompt and evaluating their skills as they pick resources while performing research. These students were also asked to explain their thoughts during this process, which were transcribed. These interviews served to provide the students' actual research skills.

We compared how students scored themselves versus how the interviews scored them in our "perceived skills" versus "actual skills" data analysis. Upon completing the separate analyses for the qualitative and quantitative data, our group combined used two methods to to draw conclusions.

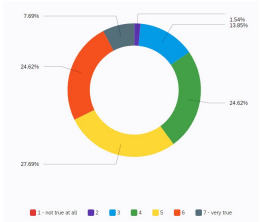
- Method 1: Finding significant results in the qualitative data, and finding quantitative data to confirm or deny those results
- Method 2: Starting with commonly highly or lowly ranked questions from the survey in the quantitative analysis, and using qualitative data to confirm or deny those results

Final Results

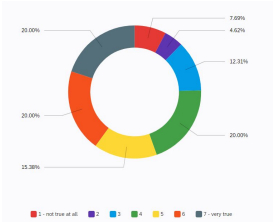
Overall: Students ranked themselves lower then interviewers did. This means we found a difference in the research skills students believe they have, versus the skills they actually have when picking an informational source. The team attributes this difference to either the form of how the Qualtrics survey was administered, having students rank themselves numerically rather than speaking or writing about their skills, or students having a lack of information literacy skills and terminology in an everyday sense. From the specific survey questions we found all students ranked themselves very strongly high or low on, the team discovered that students have high information literacy skills in their ability to pick a resource with relevant and accurate information, from trustworthy and academic sources. Alternatively, students need improvements in considering the end user of their product when picking resources and determining if their chosen resources have enough information to answer their research prompt.

Method 1 - Q15: I evaluated the trustworthiness of the sources I found.

Method 2 - Q 30: I gathered information from potential end users of my product.



Q15: Shows a range of responses.



Q30: Had the highest number of students ranking themselves highly

FMEA

Process Step/Input	Potential Failure Mode	Potential Failure Effects	SEVERITY (1 - 10)	Potential Causes	OCCURRENCE (1 - 10)	Current Controls	DETECTION (1 - 10)	RPN	Action Recommended
What is the process step or feature under investigation?	In what ways could the step or feature go wrong?	What is the impact on the customer if this failure is not prevented or corrected?		What causes the step or feature to go wrong? (how could it occur?)		What controls exist that either prevent or detect the failure?			What are the recommended actions for reducing the occurrence of the cause or improving detection?
Interview Analysis	Misinterpretation of the data	Failure to record data	9	User did not record data	2	Use software correctly	3	54	Train with software
Gift Card Acquisition	Failure to acquire gift cards	No financial incentive	10	Human error	2	Make notes	3	60	Make reminders
Qualtrics	Bad user proficiency	Corrupt survey data	10	Poor training	5	Train with professionals	3	150	Learn software
WMatrix	Poor Usage	Inconclusive results	8	Poor software recognition	4	Train with previous users	2	64	Learn software
SPSS	Poor Usae	Inconclusive results	10	Poor software recognition	5	Train with previous users	3	150	Learn software
IRB	Unapproved submission	Stalls project	9	Poor editing	3	Edit with team	2	36	Proof read
Scribie	Poor transcription	Poor data	10	Bad transcription	2	Observe data	2	40	Use a manual

Testing

W-Matrix: This software was used to analyse the qualitative data gathered from the interview transcripts and short answer survey questions. W-Matrix uses semantic tagging to highlight significant themes in our qualitative data. An example from an interview transcript is given below.

	Item	O1	%1	O2	%2	LL	LogRatio	
1	List1 | Concordance	X2.3+	35	2.81	541	0.06 +	203.37	5.65	Learning
2	List1 | Concordance	S6+	45	3.61	4007	0.41 +	114.76	3.12	Strong obligation or necessity
3	List1 | Concordance	A12-	11	0.88	1112	0.12 +	25.62	2.94	Difficult
4	List1 | Concordance	A15+	3	0.24	308	0.03 +	6.91	2.92	Safe
5	List1 | Concordance	A5.1++	4	0.32	525	0.05 +	7.55	2.56	Evaluation: Good
6	List1 | Concordance	X9.1+	7	0.56	1016	0.10 +	12.08	2.42	Able/intelligent
7	List1 | Concordance	A1.5.1	11	0.88	1737	0.18 +	17.45	2.38	Using
8	List1 | Concordance	X6.2	13	1.04	2524	0.26 +	16.49	2.08	Mental object: Means, method
9	List1 | Concordance	Y2	8	0.64	1610	0.17 +	9.72	1.95	Information technology and computing
10	List1 | Concordance	X2.5+	6	0.48	1205	0.12 +	7.31	1.95	Understanding
11	List1 | Concordance	X3.4	12	0.96	3132	0.32 +	10.20	1.57	Sensory: Sight
12	List1 | Concordance	A1.1.1	42	3.37	11651	1.21 +	32.36	1.48	General actions / making
13	List1 | Concordance	X2.2+	13	1.04	4211	0.44 +	7.55	1.26	Knowledgeable
14	List1 | Concordance	Z8	153	12.28	84722	8.76 +	10.57	0.49	Pronouns
15	List1 | Concordance	Z99	19	1.52	26205	2.71 -	7.68	-0.83	Unmatched
16	List1 | Concordance	M1	5	0.40	10439	1.08 -	7.01	-1.43	Moving, coming and going
17	List1 | Concordance	N1	5	0.40	12234	1.27 -	10.04	-1.66	Numbers
18	List1 | Concordance	B1	2	0.16	8864	0.92 -	11.87	-2.51	Anatomy and physiology
19	List1 | Concordance	Z2	1	0.08	11159	1.15 -	21.42	-3.85	Geographical names

SPSS: This software was used for our quantitative data analysis. Two types of tests were conducted on survey and interview rubric data: Chi-Square and Wilcoxon.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	130.000[a]	12	<.001
Likelihood Ratio	142.068	12	<.001
Linear-by-Linear Association	56.896	1	<.001
N of Valid Cases	65		

a. 20 cells (95.2%) have expected count less than 5. The minimum expected count is 1.85.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
SUJS1ACTUAL	1	7.00	.	7	7	.	.	.
SASA2 ACTUAL	1	7.00	.	7	7	.	.	.
INRI3 ACTUAL	1	4.00	.	4	4	.	.	.
SUJS1 PERCIEVED	1	3.00	.	3	3	.	.	.
SASA2 PERCIEVED	1	2.00	.	2	2	.	.	.
INRI3 PERCEIVED	1	1.00	.	1	1	.	.	.

[1] *Wilmeth Active Learning Center (WALC)*. Accessed: Apr. 14, 2022. [Online]. Available: http://purdue.bar-z.com/408/location/wilmeth-active-learning-center-walc

[2] K. A. Douglas, T. Fernandez, M. Fosmire, A. S. V. Epps, and S. Purzer, "Self-directed information literacy scale: A comprehensive validation study," *J. Eng. Educ.*, vol. 109, no. 4, pp. 685–703, 2020, doi: 10.1002/jee.20355.