

Active Learning Strategies for Course Enhancement: Monitoring Adverse Event Reporting in Twitter

Sigma Theta Tau International
28th International Nursing Research Congress
Janet Thorlton, Ph.D., R.N.
July 2017

Disclosure & Acknowledgements

Disclosure

- No conflict of interest
- No sponsorship or commercial support was given to author

Acknowledgements

- Center for Medication Safety Advancement at the Purdue College of Pharmacy and the Rosen Center for Advanced Computing
 - Anne Christine Catlin (Advanced Computing)
 - Dr. Dan Degnan (Pharmacy)
 - Barrett Beach, Pareen Modi, Nicolette Mehas, Emily Mocanda, Lindsay Moreland (former Pharmacy Students)
- Regenstrief Center for Health Care Engineering – REMEDI Infusion Pump Informatics project
 - Rich Zink (Industrial Engineer)
- Purdue University Medical Librarian
 - Bethany McGowan, (Library Science)

Learning Objectives

- Describe the 6 Grasha-Riechmann Student Learning Styles and strategies for creating an active learning environment ("flipped classroom" model) to engage undergraduate nursing students.
- Describe method for assessing concordance of Twitter postings of adverse events to Federal Adverse Event Reporting System (FAERS) data, as a learning activity.

Expanded Content Outline

- Discuss characteristics of the 6 learning styles (Competitive, Collaborative, Avoidant, Participant, Dependent, Independent).
 - List examples of active learning strategies used in NUR223 Foundations of Research & Evidence Based Practice course (i.e., group projects, integrative literature review, create professional posters)
- Demonstrate Twitter search and use of filters
- Discuss student learning activity (Compare Twitter to FAERS data, student conclusions and lessons learned)

Introduction

Students lose interest, become bored if not actively engaged in learning process...

...they must read, write, discuss, or be engaged in solving problems (Chickering & Gamson, 1987).

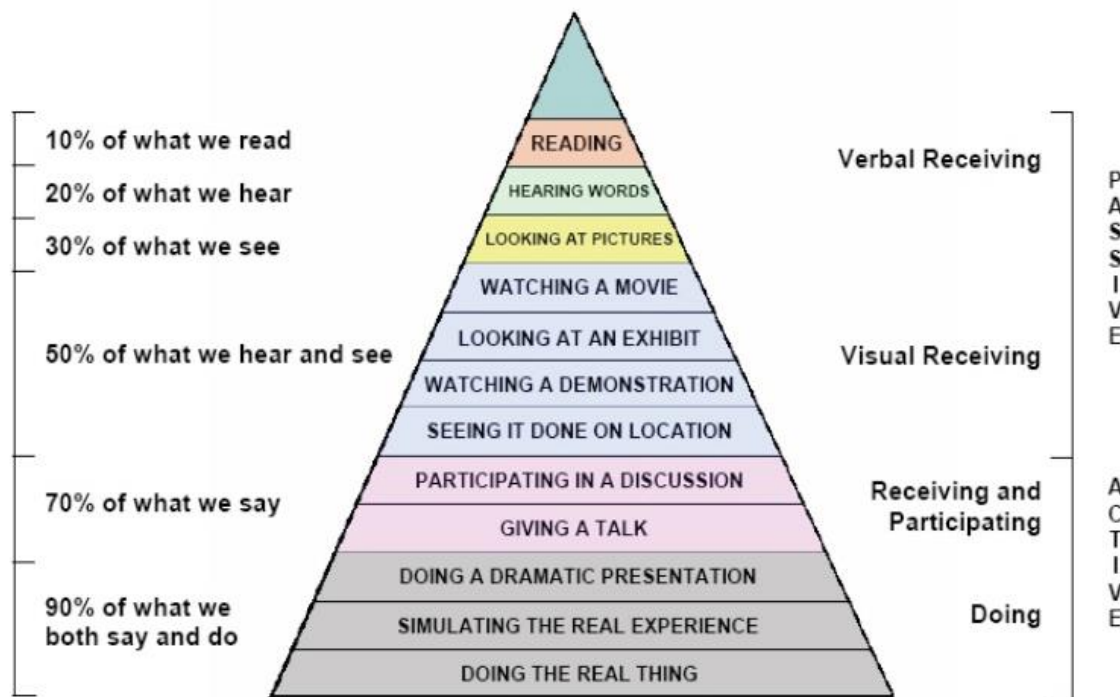


Active Learning

CONE OF LEARNING

WE TEND TO REMEMBER OUR LEVEL OF INVOLVEMENT

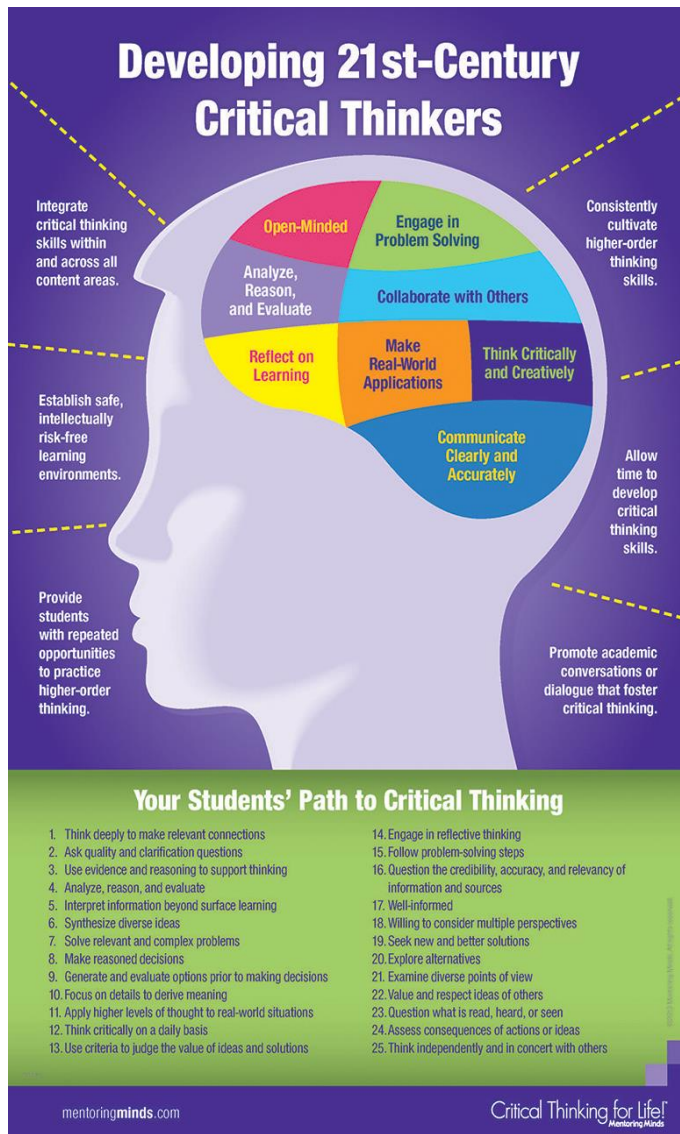
(developed and revised by Bruce Hyland from material by Edgar Dale)



Edgar Dale, *Audio-Visual Methods in Teaching* (3rd Edition). Holt, Rinehart, and Winston (1969).

- Active learning is based on the theory of constructivism—learners “construct,” or build their own understanding
- Active learning methods of teaching result in more student retention

Active Learning



- ▶ Active learning allows students:
 - ▶ time to process material
 - ▶ link material to previous knowledge
 - ▶ To reinforce lecture content by providing a context in which to apply material
 - ▶ an opportunity to check their understanding of material
- ▶ Active learning techniques meet expectations outlined in *The Essentials of Baccalaureate Education for Professional Nursing*

Course Core Competencies

- ▶ Demonstrate **Technology & Computer Literacy** skills for using computers and related technology efficiently.
- ▶ Apply **Information Literacy** skills: locate, retrieve, organize, evaluate, summarize, and present research evidence from sources relevant to nursing and healthcare.
- ▶ Use **Inquiry & Analysis** and **Quantitative Literacy** skills to appraise qualitative and quantitative information related to nursing and healthcare.
- ▶ Apply **Creative Thinking, Critical Thinking, Ethical Reasoning, Integrative Learning, Leadership, Problem-solving, Teamwork, Oral & Written Communication** skills in team discussions and group projects.



Association of American Colleges and Universities. (2009).
Inquiry and analysis VALUE rubric. Retrieved from
<https://www.aacu.org/value/rubrics/inquiry-analysis>

Each rubric was developed from the most frequently identified learning criteria for 16 Liberal Education and America's Promise (LEAP) Essential Learning Outcomes.

INFORMATION LITERACY VALUE RUBRIC

for more information, please contact valuel@aacu.org



Definition

The ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively and responsibly use and share that information for the problem at hand. - The National Forum on Information Literacy

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (all one) level performance.

	Capstone 4	Milestones 3 2		Benchmark 1
Determine the Extent of Information Needed	Effectively defines the scope of the research question or thesis. Effectively determines key concepts. Types of information (sources) selected directly relate to concepts or answer research question.	Defines the scope of the research question or thesis completely. Can determine key concepts. Types of information (sources) selected relate to concepts or answer research question.	Defines the scope of the research question or thesis incompletely (parts are missing, remains too broad or too narrow, etc.). Can determine key concepts. Types of information (sources) selected partially relate to concepts or answer research question.	Has difficulty defining the scope of the research question or thesis. Has difficulty determining key concepts. Types of information (sources) selected do not relate to concepts or answer research question.
Access the Needed Information	Accesses information using effective, well-designed search strategies and most appropriate information sources.	Accesses information using variety of search strategies and some relevant information sources. Demonstrates ability to refine search.	Accesses information using simple search strategies, retrieves information from limited and similar sources.	Accesses information randomly, retrieves information that lacks relevance and quality.
Evaluate Information and its Sources Critically	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
Use Information Effectively to Accomplish a Specific Purpose	Communicates, organizes and synthesizes information from sources to fully achieve a specific purpose, with clarity and depth.	Communicates, organizes and synthesizes information from sources. Intended purpose is achieved.	Communicates and organizes information from sources. The information is not yet synthesized, so the intended purpose is not fully achieved.	Communicates information from sources. The information is fragmented and/or used inappropriately (misquoted, taken out of context, or incorrectly paraphrased, etc.), so the intended purpose is not achieved.
Access and Use Information Ethically and Legally	Students use correctly all of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrate a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly three of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly two of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.	Students use correctly one of the following information use strategies (use of citations and references; choice of paraphrasing, summary, or quoting; using information in ways that are true to original context; distinguishing between common knowledge and ideas requiring attribution) and demonstrates a full understanding of the ethical and legal restrictions on the use of published, confidential, and/or proprietary information.

Permission for use from "VALUE: Valid Assessment of Learning in Undergraduate Education."

Copyright 2017 by the Association of American Colleges and Universities.

<http://www.aacu.org/value/index.cfm>.

Purpose

- ▶ The purpose of this pre-test/post-test quasi-experimental study was to evaluate the impact of active learning techniques designed to appeal to 6 student learning styles.

Background: FDA Adverse Event Reporting System

- ▶ The FDA Adverse Event Reporting System (FAERS) is a relational database that contains information on adverse event and medication error reports submitted to FDA.
- ▶ Downloadable files (Jan. 2004-present) include: case reports, reaction type, patient outcome, source of report.
- ▶ No online searchable database
- ❖ Quarterly updates
- ❖ Who reports events to FAERS?
 - ❖ Healthcare professionals (e.g., physicians, pharmacists, nurses)
 - ❖ Consumers (e.g., patients, family members, lawyers, manufacturers) via MedWatch FDA Safety Information & Adverse Event Reporting Program.

FDA Adverse Events Reporting System (FAERS)

▶ FDA Adverse Event Reporting System (FAERS): Latest Quarterly Data Files

FDA Adverse Event Reporting System (FAERS) Statistics

Potential Signals of Serious Risks/New Safety Information Identified from the FDA Adverse Event Reporting System (FAERS)

FDA Adverse Events Reporting System (FAERS) Electronic Submissions

FDA Adverse Event Reporting System (FAERS): Latest Quarterly Data Files

[f SHARE](#)
[TWEET](#)
[in LINKEDIN](#)
[PIN IT](#)
[EMAIL](#)
[PRINT](#)

The files listed on this page contain raw data extracted from the AERS database for the indicated time ranges and are not cumulative.

Users of these files need to be familiar with creation of relational databases using applications such as ORACLE®, Microsoft Office Access, MySQL® and IBM DB2 or the use of ASCII files with SAS® analytic tools.

A simple search of FAERS data cannot be performed with these files by persons who are not familiar with creation of relational databases. However, you can get a summary FAERS report for a product by sending a Freedom of Information Act (FOIA) request to FDA. You can also request individual case reports by submitting a FOIA request listing case report numbers.

- [General Instructions on How to Make a FOIA Request](#)
- [Instructions for Requesting Individual Case Reports](#)

The quarterly data files, which are available in ASCII or SGML formats, include:

- demographic and administrative information and the initial report image ID number (if available);
- drug information from the case reports;
- reaction information from the reports;
- patient outcome information from the reports;
- information on the source of the reports;
- a "README" file containing a description of the files.

For assistance, please email the FDA/CDER Office of Surveillance and Epidemiology, Division of Medication Errors and Technical Support: cderosetracking@fda.hhs.gov.

FAERS Data Files

Click on a link below to begin downloading.

- [FAERS ASCII 2016q1 \(ZIP - 43.7MB\)](#)
January - March 2016
- [FAERS XML 2016q1 \(ZIP - 71.5MB\)](#)
January - March 2016
- [FAERS ASCII 2015q4 \(ZIP - 39.7MB\)](#)
October - December 2015
- [FAERS XML 2015q4 \(ZIP - 65.8MB\)](#)
October - December 2015
- [FAERS ASCII 2015q3 \(ZIP - 44.7MB\)](#)
July - September 2015
- [FAERS XML 2015q3 \(ZIP - 73.3MB\)](#)
July - September 2015
- [FAERS ASCII 2015q2.zip \(ZIP - 36.4MB\)](#)
April - June 2015
- [FAERS XML 2015q2.zip \(ZIP - 59.9MB\)](#)
April - June 2015
- [FAERS ASCII 2015q1.zip \(ZIP - 37MB\)](#)
January - March 2015
- [FAERS XML 2015q1.zip \(ZIP - 60.7MB\)](#)
January - March 2015
- [FAERS ASCII 2014q4.zip \(ZIP - 26.8MB\)](#)
October - December 2014
- [FAERS XML 2014q4.zip \(ZIP - 45.4MB\)](#)
October - December 2014
- [FAERS ASCII 2014q3.zip \(ZIP - 27MB\)](#)

FAERS Dec. 2016 (n=758,848)

primaryid\$caseid\$indi_drug_seq\$indi_pt100035465\$10003546\$1\$Myelofibrosis100035465\$10003546\$4\$Product used for unknown indication100035465\$10003546\$5\$Product used for unknown indication100039307\$10003930\$1\$Multiple sclerosis100039307\$10003930\$2\$Product used for unknown indication100043982\$10004398\$1\$Low density lipoprotein increased100043982\$10004398\$2\$Cardiovascular event prophylaxis100043982\$10004398\$3\$Blood cholesterol increased100048338\$10004833\$1\$Non-small cell lung cancer100052592\$10005259\$1\$Multiple sclerosis100052592\$10005259\$2\$Depression100052592\$10005259\$3\$Depression100052592\$10005259\$4\$Depression100052592\$10005259\$5\$Depression100054312\$10005431\$1\$Hepatitis C100054312\$10005431\$2\$Hepatitis C100054312\$10005431\$3\$Prophylaxis against transplant rejection100055137\$10005513\$1\$Rheumatoid arthritis100055137\$10005513\$5\$Rheumatoid arthritis100055137\$10005513\$6\$Rheumatoid arthritis100055137\$10005513\$7\$Rheumatoid arthritis100055137\$10005513\$8\$Cardiovascular disorder100055137\$10005513\$9\$Heart rate increased100055142\$10005514\$1\$Product used for unknown indication100055142\$10005514\$2\$Product used for unknown indication100055142\$10005514\$3\$Product used for unknown indication100060222\$10006022\$1\$HER-2 positive breast cancer100062633\$10006263\$1\$Insulin resistance100062633\$10006263\$2\$Glucose tolerance impaired100062633\$10006263\$3\$Insulin resistance100062633\$10006263\$4\$Glucose tolerance impaired100062633\$10006263\$5\$Insulin resistance100062633\$10006263\$6\$Glucose tolerance impaired100085063\$10008506\$1\$Pulmonary arterial hypertension100095954\$10009595\$1\$Lymphoma100095954\$10009595\$2\$Lymphoma100095954\$10009595\$3\$Hypertension100095954\$10009595\$4\$Hypertension100095954\$10009595\$5\$Infection100095954\$10009595\$6\$Infection100095954\$10009595\$7\$Infection100095954\$10009595\$8\$Hypertension100095954\$10009595\$10\$Infection100095954\$10009595\$11\$Gastric ulcer100095954\$10009595\$12\$Gastric ulcer100095954\$10009595\$13\$Neutropenia100095954\$10009595\$14\$Pyrexia100095954\$10009595\$15\$Nausea100101343\$10010134\$6\$Product used for unknown indication100101343\$10010134\$7\$Product used for unknown indication100101343\$10010134\$8\$Product used for unknown indication100101343\$10010134\$9\$Product used for unknown indication100101343\$10010134\$10\$Product used for unknown indication100101343\$10010134\$11\$Product used for unknown indication100101343\$10010134\$12\$Product used for unknown indication100121016\$10012101\$1\$Fluid retention100121016\$10012101\$2\$Product used for unknown indication100121016\$10012101\$3\$Prophylaxis against gastrointestinal ulcer100121016\$10012101\$4\$Cardiac failure100121016\$10012101\$5\$Cardiac failure100121016\$10012101\$6\$Cardiac failure100121016\$10012101\$7\$Cardiac failure100121016\$10012101\$9\$Product used for unknown indication100123485\$10012348\$1\$Acute graft versus host disease100123485\$10012348\$2\$Bone marrow conditioning regimen100123485\$10012348\$3\$Bone marrow conditioning regimen100123485\$10012348\$4\$Acute graft versus host disease100123485\$10012348\$5\$Prophylaxis against graft versus host disease100123485\$10012348\$6\$Acute graft versus host disease100128263\$10012826\$1\$Product used for unknown indication100128263\$10012826\$2\$Product used for unknown indication100128263\$10012826\$3\$Product used for unknown indication1001355822\$10013558\$1\$Asthma1001355822\$10013558\$10\$Product used for unknown indication1001355822\$10013558\$11\$Product used for unknown indication1001355822\$10013558\$12\$Product used for unknown indication1001355822\$10013558\$13\$Product used for unknown indication100139636\$10013963\$1\$Product used for unknown indication100139636\$10013963\$2\$Product used for unknown indication100139636\$10013963\$3\$Product used for unknown indication100139636\$10013963\$4\$Product used for unknown indication100139636\$10013963\$5\$Product used for unknown indication100139636\$10013963\$6\$Product used for unknown indication100139636\$10013963\$7\$Product used for unknown indication100140375\$10014037\$1\$Chronic spontaneous urticaria100140513\$10014051\$1\$Rheumatoid arthritis100140558\$10014055\$1\$HIV infection100145359\$10014535\$1\$Prostate cancer100145359\$10014535\$2\$Bone cancer100145359\$10014535\$3\$Product used for unknown indication

Background: SafeRx and FAERS

- ▶ SafeRx is a searchable data repository built on HUBzero cyberinfrastructure for research and education, which allows registered users to study adverse events across populations and to look for trends in the ways people are harmed by drugs, thereby highlighting steps that can be taken to improve medication safety.
- ▶ The SafeRx database is used to investigate questions such as whether adverse events reported by patients match up with known side effects reported to the US Food and Drug Administration (USFDA).
- ▶ The SafeRx database merges information from the National Drug Code Registry and the National Library of Medicine

SafeRx Data Explorer

SafeRx is offered free of any charge to academic users and also to those from medical institutions who are conducting research. To obtain access:

Step 1: Register for an account using an academic or hospital email address at <http://ccehub.org>

Step 2: Request access to Purdue SafeRx by emailing Ann Christine Catlin: acc@purdue.edu

Step 3: Once approved, you will receive an email from confirming your access to the FDA: FAERS Data Explorer on the Purdue SafeRx Dashboard.

Active Learning Exemplar

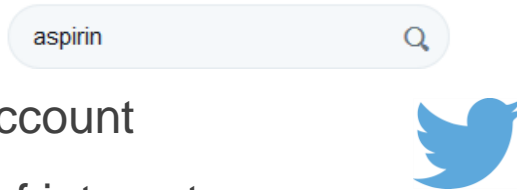
- ▶ The [Federal Adverse Event Reporting System \(FAERS\)](#) suffers from under-reporting and data processing delays
- ▶ Consumers are increasingly reporting adverse experiences on Twitter
- ▶ Students can learn about real-world experiences from Twitter postings, and common pitfalls encountered when working with large volumes of data
- ▶ Student groups create PICOT questions that include a drug
 - ▶ Students apply knowledge from assigned readings (e.g., Twitter project, modified integrative review of literature, poster projects)

FAERS Data Collection and Analysis

- ▶ Goal: Using the SafeRx database, determine if Twitter ADEs are consistent with ADEs reported to FDA
- ▶ Prepare a brief Background section, including a problem & purpose statement
- ▶ Prepare a rank-sorted visual display of data (e.g. bar chart) comparing Tweets and FAERS data
- ▶ Prepare a Conclusion section, including interesting or surprise findings (e.g., cost of drug, safety issues), lessons learned, limitations of study, overall findings.
- ▶ Reflection:
 - what I learned*
 - what I most enjoyed in this class*
 - what I would do differently if I took this course again*
 - who in my group deserves a thank you*

Instructions for Activity

- ▶ Twitter.com: create a Twitter account
- ▶ Using search bar, enter drug of interest
- ▶ Narrow your search using Twitter Search Filters and Advanced Search features
 - ▶ Words, languages, location, date range
- ▶ Goal: find 300 tweets that mention adverse drug events. Calculate rate (%) of tweets containing Adverse Drug Events (as defined by FDA)
 - ▶ *Person reporting ADE, Person experiencing ADE, Name of drug, Event/Outcome*
- ▶ Record this information in a spreadsheet to rank sort and create bar graph
- ▶ Twitter mining reveals ADE data that can be compared to data available in the FDA Adverse Event Reporting System (FAERS).
- ▶ Evaluate the level of concordance between Twitter posts mentioning adverse events and reports received by FAERS



Advanced Muting Options for Twitter

- ▶ You might see content in Tweets you'd like to avoid.
- ▶ Via the Twitter.com *Settings & Privacy* drop down menu, you have the option to “mute” (or filter) Tweets that contain particular words, phrases, usernames, emojis, or hashtags.

Source: Twitter.com (2017). *Advanced muting options on Twitter*. Retrieved from: <https://support.twitter.com/articles/20175032#>

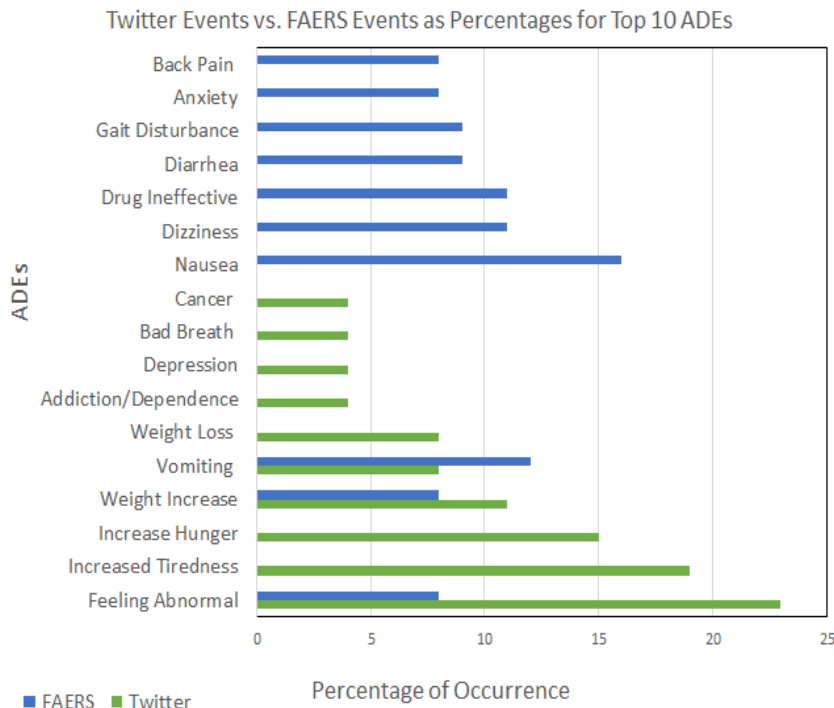
Introduction

Medical marijuana was chosen in order to research it as a new form of treatment for epilepsy. We will compare 300 random tweets collected between 01/01/2016 to 01/01/2017 to the side effects on FDA Adverse Event Reporting System (FAERS).

Top 10 Twitter ADEs

SIDE EFFECTS NUMBER OF REPORTS

Feeling Abnormal	12
Increased Tiredness	10
Increased Hunger	8
Weight Increase	6
Weight Loss	4
Vomiting	4
Bad Breath	2
Addiction/Dependence	2
Depression	2
Cancer	2



Percentage of Occurrence

Conclusions

- The most frequently reported adverse drug event (ADE) on Twitter was mood change and this was not reported on FAERS.
- The most frequently reported ADE on FAERS was nausea. This was not reported on Twitter.
- The ADEs reported on FAERS were referencing the effects of marijuana for medical use only, where as on Twitter many people may have been taking it recreationally. This would contribute to the differences in side effects due to the differences in doses.
- On twitter, symptoms that are seen as embarrassing may not be reported as much as those that are not.
- One limitation of our project is that we did not compare the same date range between Twitter and FAERS. Another limitation to our data is that we did not use the same number of ADEs for each, however they were close enough to not skew our data dramatically.

FAERS Data

Analysis of Data:

- Total number of reported ADEs: 145
- Top 10 ADEs used: 87
- Medical marijuana has only 145 ADEs reported because it is a newer, controversial drug.
- The FAERS data was collected from 1/2013 to 5/2016

Twitter Data

Analysis of Tweets:

- 17% (52) of 300 Tweets contained at least one ADE.
- 52 ADEs were reported
- Collected from 1/1/2016-12/31/2016

Top 10 FAERS ADEs

SIDE EFFECTS NUMBER OF REPORTS

Nausea	14
Vomiting	10
Dizziness	9
Drug Ineffective	9
Diarrhea	8
Gait Disturbance	8
Anxiety	7
Back Pain	7
Feeling Abnormal	7
Weight increases	7

Methods

- ▶ Mixed methods, pre-test/post-test survey design (IRB Protocol #1611018477) using active learning techniques as an intervention.
- ▶ Sophomore level college students (n=126) enrolled in Foundations of Research & EBP; 5 points awarded completing in-class Grasha-Reichmann Student Learning Style Survey (GRSLSS) .
- ▶ Paired sample t-tests used to compare the mean scores. Cohen's d was calculated to magnitude of the intervention's effect on six learning styles. Level of significance was set at $p < .05$.

Pre-Test / Post-Test

Grasha-Reichmann Student Learning Style Survey (GRSLSS)

- ▶ Pre-Test week 1: students (n=126) complete an in-class electronic survey using the GRSLSS **General Class Form**:
 - ▶ *The following questionnaire has been designed to help clarify your attitudes and feelings **toward the courses you have taken thus far in college**. There are no right or wrong answers...As you answer each question, respond with regard to your general attitudes and feelings **towards all of your courses**.*
- ▶ Post-Test week 16: students complete an in-class electronic survey using the **GRLSS Specific Class Form**:
 - ▶ *The following questionnaire has been designed to help clarify your attitudes and feelings **toward this class**. There are no right or wrong answers...As you answer each question, respond with regard to your attitudes and feelings **towards this particular class***

Grasha-Reichmann Student Learning Style Inventory (GRSLSS)

- ▶ GRSLSS assesses 6 student learning styles
- ▶ High reliability across scales ($r = .76$ to $r = .83$)
- ▶ 60 questions
- ▶ Respond to the items listed by using the following scale:
 - ▶ 1 = strongly disagree
 - ▶ 2 = moderately disagree
 - ▶ 3 = undecided
 - ▶ 4 = moderately agree
 - ▶ 5 = strongly agree

Scores represent Low, Moderate, or High based on the norms for each learning style scale below:

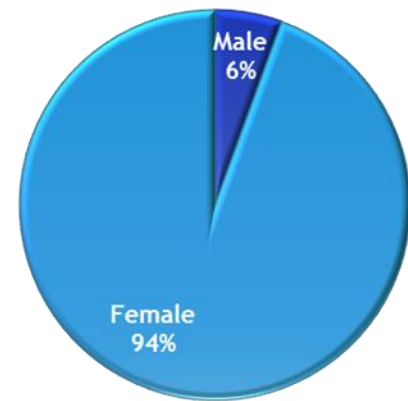
	Low	Moderate	High
Independent	[1.0-2.7]	[2.8-3.8]	[3.9-5.0]
Avoidant	[1.0-1.8]	[1.9-3.1]	[3.2-5.0]
Collaborative	[1.0-2.7]	[2.8-3.4]	[3.5-5.0]
Dependent	[1.0-2.9]	[3.0-4.0]	[4.1-5.0]
Competitive	[1.0-1.7]	[1.8-2.8]	[2.9-5.0]
Participant	[1.0-3.0]	[3.1-4.1]	[4.2-5.0]

6 Learning Styles	Description	Preferences
Competitive	<ul style="list-style-type: none"> Learn material in order to perform better than others Feel they must compete with other students for the rewards that are offered. 	<ul style="list-style-type: none"> ✓ Group discussion leader; like to dominate discussions ✓ Being singled out in class for doing a good job. ✓ Prefer activities where they can do better than others.
Collaborative	<ul style="list-style-type: none"> Feel they can learn by sharing ideas and talents. Cooperate with teacher, peers; like to work with others. 	<ul style="list-style-type: none"> ✓ Lectures with class discussions in small groups. ✓ Small seminars. ✓ Group, rather than individual projects.
Avoidant	<ul style="list-style-type: none"> Not enthusiastic about learning content, attendance. Does not participate with students & teachers Disinterested, overwhelmed by what goes on in class. 	<ul style="list-style-type: none"> ✓ Generally turned off by most classroom activities. ✓ Would prefer no tests. ✓ Blanket grades where everyone gets a passing grade. ✓ Dislike enthusiastic teachers.
Participant	<ul style="list-style-type: none"> Good citizens in class. Enjoy going to class; take responsibility for getting the most out of a course. Want to take part in as much activity as possible. 	<ul style="list-style-type: none"> ✓ Lectures with discussion. ✓ Opportunities to discuss material. ✓ Class reading assignments. ✓ Teachers who can analyze and synthesize information well.
Dependent	<ul style="list-style-type: none"> Show little intellectual curiosity Learn only what is required. View teacher, peers as sources of structure, support; look to authority figures for specific guidelines 	<ul style="list-style-type: none"> ✓ Outlines, notes on the board. ✓ Clear deadlines and instructions for assignments. ✓ Teacher centered classroom methods. ✓ As little ambiguity as possible in all aspects of course.
Independent	<ul style="list-style-type: none"> Students who like to think for themselves. Prefer to work alone but will listen to ideas of others. Learn content they feel is important and are confident in their learning abilities. 	<ul style="list-style-type: none"> ✓ Independent study; prefer to work alone. ✓ Self-paced instruction. ✓ Student-centered rather than teacher-centered course designs.

Results

- ▶ Average time to complete electronic survey: 5.8 minutes
- ▶ Mean age: 19
- ▶ Statistically significant differences on the *Independent, Dependent, Competitive, and Participant Style* scores.
- ▶ No significant differences were noted for the *Collaborative Style* of learning—expected for this age group.

NUR223 Students 2016-2017
(N=126)



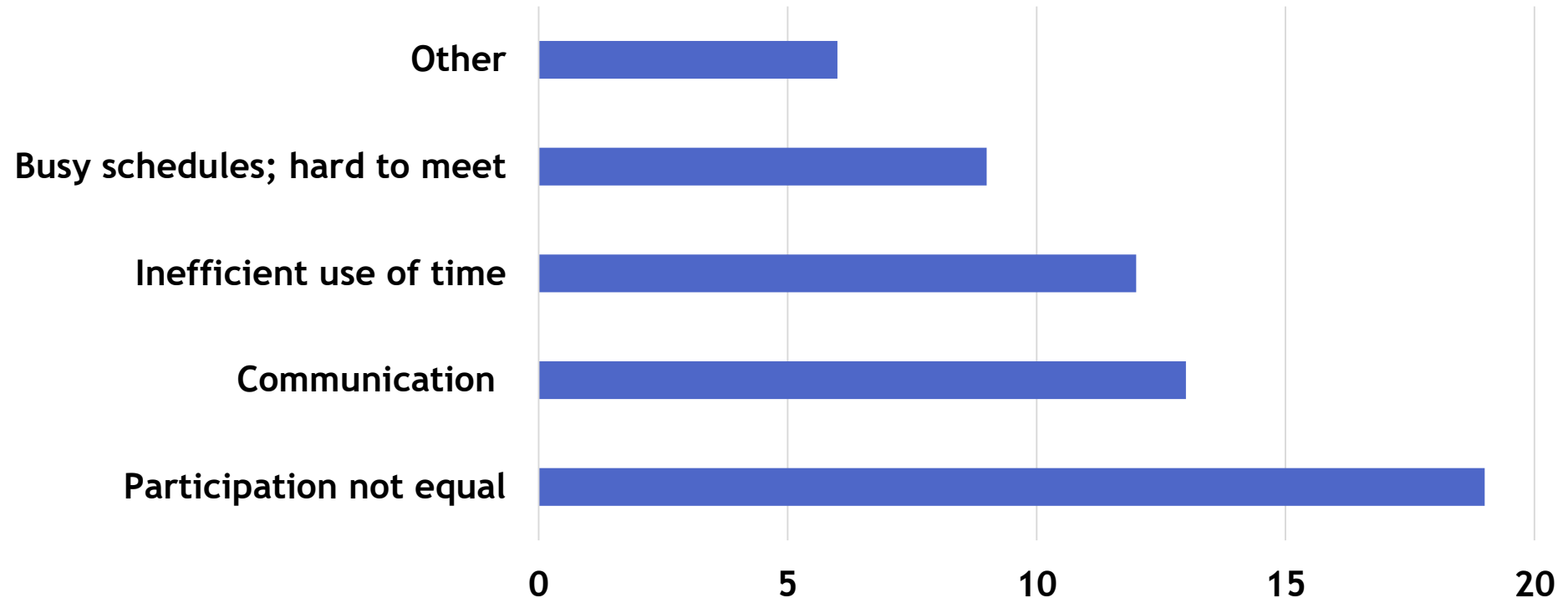
Results

Learning Style	Time 1 (M, SD)	Time 2 (M, SD)	t	Cohen's d
Independent	3.38 (0.36)	3.21 (0.41)	2.22*	0.42
Dependent	3.81 (0.35)	3.61 (0.34)	3.46**	0.57
Collaborative	3.79 (0.34)	3.82 (0.32)	1.52	0.01
Competitive	2.66 (0.50)	2.43 (0.53)	2.34*	0.43
Participative	3.96 (0.38)	3.75 (0.44)	2.63*	0.50
Avoidant	2.56 (0.54)	2.87 (0.58)	-3.17*	-0.56

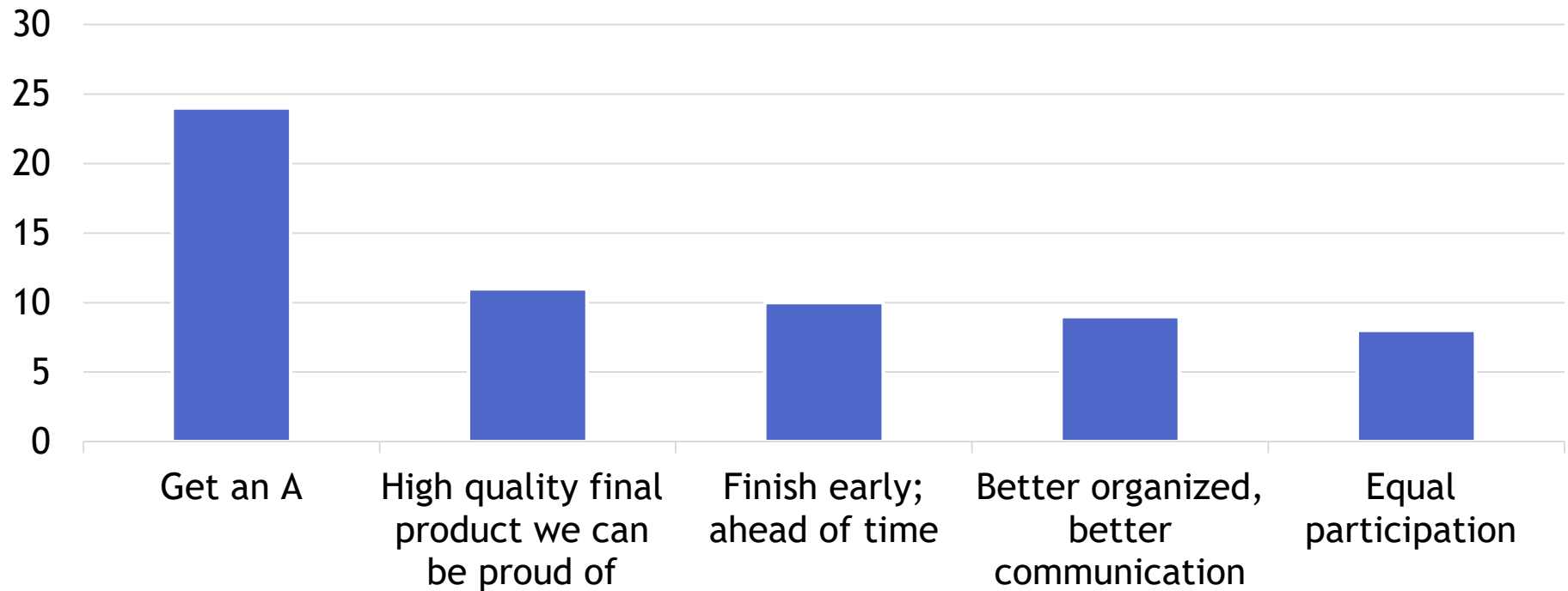
Note: M = mean, SD = standard deviation; * $p < .05$, ** $p < .001$

Reflection

Things I like least about my group...



I'd like to see us accomplish on our final project...



Discussion

- ▶ Students expressed enthusiasm and interest in this learning activity.
- ▶ Overall themes emerging
 - ▶ *What I learned:* drug adverse events on Twitter are not always the same as those reported in the FAERS data, teamwork, professionalism, time management, and new skills (APA formatting, Excel, Zotero, Microsoft One-Drive, using GroupMe for communications, conducting literature searches, data mining).
 - ▶ *What I most enjoyed:* learning the importance of EBP for nursing and how it will help me in my role as a professional nurse, working in small groups, flipped classroom and active learning methods (as opposed to lectures), the FAERS: Twitter project, learning Zotero, creating a professional poster.
 - ▶ *What I would do differently:* change or revise my PICOT question, proofread for details, follow instructions more closely, better time management, delegation in groups, complete assigned readings, start sooner to create the poster and literature tables.

Limitations

- ▶ No control group used for this study; future studies needed
- ▶ 94% female participants—future studies should include more diverse samples
- ▶ Faculty teaching style was not measured or factored into this study design / intervention.

Conclusions

- ▶ Active learning strategies are ideally suited to evidence based practice courses; appealing to competitive, independent, participative learning style
 - ▶ AACU VALUE Rubric: Course competencies achieved through contributions of interdisciplinary team
- ▶ Students found the projects meaningful, interesting, and important for their future role as professional nurses.
- ▶ The cost-effective active learning techniques used in this course helped undergraduate students to become savvy consumers of research, while improving student engagement and satisfaction.
- ▶ Using Twitter, the publicly available FAERS dataset and working in group projects was a popular way to reinforce knowledge needed by nurses around the world (e.g., teamwork, delegation, information literacy, basic data mining and analysis, awareness of consumer/patient safety issues, time management, awareness of adverse events, including off-label use of drugs).
- ▶ Skills learned in this course may be transferred into subsequent courses (e.g. Leadership & Management), serving as a foundation for higher level coursework.

References

- American Association of Colleges of Nursing (2008). *The essentials of baccalaureate education for professional nursing practice*. Retrieved from: www.aacn.nche.edu/education-resources/BaccEssentials08.pdf
- Association of American Colleges and Universities. (2009). *Inquiry and analysis VALUE rubric*. Retrieved from <https://www.aacu.org/value/rubrics/inquiry-analysis>
- Chickering, A. & Gamson, Z.F. (1987). Seven principles of good practice. *AAHE Bulletin*, 39, 3-7.
- Constructivism (2015, June 20). In *Learning Theories*. Retrieved from: <https://www.learning-theories.com/constructivism.html>.
- Freifeld, C.C., Brownstein, J.S., Menone, C.M., Bao, W., Filice, R., Kass-Hout, T., & Dasgupta, N. (2014). Digital drug safety surveillance: Monitoring pharmaceutical products in Twitter. *Drug Safety*, 37, 343-350. DOI 10.1007/s40264-014-0155-x.
- Fritz, M. (2002). [Using Learning Styles Inventories to Promote Active Learning](https://doi.org/10.1080/10790195.2002.10850297). *Journal of College Reading and Learning*, 32(2), 183-188. DOI 10.1080/10790195.2002.10850297
- Grasha, A.F. (2002). *Teaching with style: A practical guide to enhancing learning by understanding teaching and learning styles*. San Bernadino, CA: Alliance Publishers.
- Melnyk, B.M. & Fineout-Overholt, E. (2015). *Evidence based practice in nursing and healthcare: A guide to best practice (3rd ed)*. Philadelphia: Wolters-Kluwer.
- Miller, A. (January-February, 2017). SAFERX DATABASE ENABLES LARGE-SCALE STUDY OF PRESCRIPTION MEDICATION SAFETY. *Dimensions of Discovery*. Retrieved from: <https://www.purdue.edu/research/dimensions/saferx-database-enables-large-scale-study-of-prescription-medication-safety/>
- Riechmann, S.W. & Grasha, A.F. (1974). A rational approach to developing and assessing the construct validity of a student learning style scales instrument. *The Journal of Psychology*, 87(2).
- Twitter.com (2017). *Advanced muting options on Twitter*. Retrieved from: <https://support.twitter.com/articles/20175032#>

Questions?

Thank you!

Janet Thorlton, Ph.D., R.N.

jthorlto@purdue.edu