College of Education and Psychology
School of Education
Ed.D. in School Improvement

EDRM 6354.060: Learning Analytics

Instructor: Christopher Thomas, Ph.D.
Office: BEP 204
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Course Description (as listed in the catalog):
This course is an introduction to educational data mining and learning analytics. Learning analytics involves the application of statistical techniques to educational data for the purpose of predicting student behavior and learning. The course will cover the history and value of learning analytics. The course will also cover commonly used learning analytic techniques such as multiple regression, logistic regression, cluster analysis, and factor analysis.

Prerequisite: EDRM 6352

Last day to Withdraw from the course: March 31st, 2025

Student Learning Outcomes
After completion of this course, students will be able to:

1. Read and critically evaluate educational data mining/ learning analytics research.
2. Discuss the potential influence learning analytics can have on pedagogy and school policy.
3. Explain the logic and purpose of common learning analytic techniques.
4. Apply commonly used learning analytic techniques to educational data.
5. Correctly interpret results of commonly used learning analytic techniques.

Required Resources

Software:

JASP (v. 0.19.2 or later) - Available for free at https://jasp-stats.org/download/

JAMOVI (v. 2.3.28 solid) – Available for free at https://www.jamovi.org/

Required Readings (to be distributed by instructor):

Gignac, G. E. (2023). How2statsbook (Online Edition 2). Perth, Australia: Author.

Huang, F. L., & Moon, T. R. (2013). What are the odds of that? A primer on understanding logistic regression. *Gifted Child Quarterly, 57(3),* 197-204.

King, M. W., & Resick, P. A. (2014). Data mining in psychological treatment research: A primer on classification and regression trees. Journal of Consulting and Clinical Psychology, 82(5), 895–905. https://doi.org/10.1037/a0035886

Mertler, C. A., Vannatta, R. A., & Lavenia, K. N. (2022). Advanced and multivariate statistical methods (7th ed.). Routledge.

Osborne, J. W. (2000). Prediction in multiple regression. *Practical Assessment, Research, and Evaluation*, *7*(1), 2

Seftor, N., Shannon, L., Wilkerson, S., & Klute, M. (2021). Branching Out: Using Decision Trees to Inform Education Decisions. REL 2022-133. Regional Educational Laboratory Appalachia.

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology, 44(3),* 219-246.

Supplemental Readings (to be distributed by instructor):

Chuang, H. L. (1997). High school youths' dropout and re-enrollment behavior. *Economics of Education review, 16(2)*, 171-186.

Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical assessment, research, and evaluation*, *10*(1), 7.

Gomes, C., & Almeida, L. S. (2017). Advocating the broad use of the decision tree method in education. *Practical Assessment, Research, and Evaluation*, *22*(1), 10.

Hoyt, W. T., Imel, Z. E., & Chan, F. (2008). Multiple regression and correlation techniques: Recent controversies and best practices. Rehabilitation Psychology, 53(3), 321.

Moon, B., Morash, M., & McCluskey, J. (2021). Student violence directed against teachers: Victimized teachers' reports to school officials and satisfaction with school responses. *Journal of Interpersonal Violence, 36 (13-14),* NP7264–NP7283

Rader-Brown, L., & Howley, A. (2014). Predictors of the instructional strategies that elementary school teachers use with English language learners. *Teachers College Record*, *116*(4), 1-34.

Thomas, C. L. (2021). Predicting test anxiety using the 3x2 achievement goal model. International Journal of School & Educational Psychology, 1-11

Thomas, C. L., Zolkoski, S. M., & Sass, S. M. (2022). Investigating the psychometric properties of the social-emotional learning scale. *Assessment for Effective Intervention, 47(3),* 127-136.

Course Policies and Expectations:

<u>Use of Artificial Intelligence:</u> Most assignments in this course will permit using artificial intelligence (AI) tools, such as ChatGPT or Copilot. When AI use is permissible, it will be documented in the assignment description, and all use of AI must be appropriately acknowledged and cited. When using AI tools for assignments, add an appendix showing (a) the entire exchange (e.g., prompts used), highlighting the most relevant sections; (b) a description of precisely which AI tools were used, (c) an explanation of how the AI tools were used (e.g. to generate ideas, elements of text, etc.); and (d) an account of why AI tools were used (e.g. to save time, to surmount writer's block, to stimulate thinking, to experiment for fun, etc.). Using AI tools without appropriate acknowledgment and citation violates UT Tyler's Honor Code, constitutes plagiarism, and will be treated as such.

<u>Course Environment:</u> This is an online course that is delivered through the Canvas Learning Management System. As such, it is imperative that you check Canvas for necessary information and course materials. If you experience technical problems or have a technical question about this course, you can obtain assistance by emailing itsupport@patriots.uttyler.edu. When you email IT Support, be sure to include a complete description of your question or problem including: (1) the title and number of the course, (2) the page in question, (3) If you get an error message, a description and message number, and (4) what you were doing at the time you got the error message.

<u>Written Assignments:</u> All written assignments should be typed (double-spaced, Times New Roman, 12-point font) and submitted by midnight Central Standard Time on the due date. All written assignments should be submitted through the assignment link that I will provide. Please name written assignments using the following convention: Course Prefix, Course Number, and assignment title. **<u>Please do not put your name or other identifying information in the assignment document. I will be using settings in CANVAS that allow me to grade assignments without knowing the student's identity</u>**. All Assignments completed for other courses may **<u>NOT</u>** be turned in for this course and will be considered **academic dishonesty**.

<u>Email:</u> Questions and concerns about course content and assignments should be submitted to my email. I will make every effort to respond quickly to your emails. Generally speaking, I check

email twice a day during the workweek and less frequently on the weekend. If my schedule makes me unavailable to answer emails for an extended period, I will try to post an announcement so that you can plan accordingly. My priority is communicating with you and providing you with the tools needed to be successful in the course, so if there are any problems, we will work to solve them.

Late Work Policy: Late work refers to any course assignment that is submitted after the stated deadline. **Late work will be accepted in this class. However, there will be a 10% penalty for each late day.** Practically, this means that you will not receive credit for an assignment if you submit it after 10 or more days. Importantly, the late work policy does not apply to discussion board posts. Discussion board posts and replies will not be accepted after the stated deadline.

Student Assignments & Projects:

The course is designed to be delivered in a "module format." This means that there will be a few different modules that you will work through that include their own readings and assignments. The modules will be presented in a standardized format. The following are standard activities that will be included in the modules:

> **Readings**: This course requires a considerable degree of independent reading to ensure that you develop content mastery. There will be two main reading requirements throughout the semester. Specifically, you will be required to read selections from the course textbooks and research articles that I will assign. All research articles will be available on the Canvas site. I will also be posting supplemental readings for some of the topics that we will cover this semester. These readings are optional and provided for those who want to explore the course topics in more detail.

> **Lecture Videos:** Each week, I will post short lecture videos to the Canvas site to support the development of content mastery. The topic of each lecture video(s) will be related to key concepts found within the readings for that week. Each topic's lecture video(s) will be available on the Canvas site each Monday morning beginning at 9:00 am Central Standard Time.

> **Data Analysis Assignments:** Students will be expected to conduct and interpret the results of statistical procedures conducted using the JASP and JAMOVI software.

> **Final Project:** You will work to design and test a hypothesis using one of the provided data sets posted on Canvas. The final product will be a paper consisting of introduction, method, results, and discussion sections. Additional information about the final project will be provided later in the semester.

> **Self-Reflections:** Research shows that metacognition (the ability to reflect on study success and make changes) is critical for success in doctoral programs. As such, I will ask you to complete several low-stakes reflections to increase your metacognitive ability. I will provide information about these assignments later in the semester.

Due Date: Unless stated otherwise, all assignments are due before midnight on Sunday of the week they appear on the course schedule. In other words, each week's assignments are due before Midnight on Sunday

Grade Item	% Of final grade	Total Points
Data Analysis Assignments	74.62%	5 Assignments x 50 points per assignment = 250 points
Final Project	22.38%	75 points
Self-Reflection Assignments	2.9%	2 reflections x 5 points per reflection = 10 points
Course Total		335 points

Please note: The number, content focus, and point value of all assessments and assignments is an approximation and may change.

Letter Grades: Letter grades will be assigned using the following guidelines:
A: 90.00% of points or above, B: 80.00% -89.999% of points, C: 70.00% - 79.999% of points, D: 60.00% -69.999% of points, F: 59.999% of points or below

		Proposed Semester Schedule		
Date	**Topic(s)**	**Required Reading(s)**	**Supplemental Readings (Optional)**	**Assignments**
Week 1				
Jan 13th – Jan 19th	Introduction to Educational Data Mining & Review of Statistical Concepts			
Week 2				
Jan 20th – Jan 26th	Multiple Linear Regression (Standard & Hierarchical Model)	Gignac – Chapter 14		
Week 3				
Jan 27th – Feb 2nd	Multiple Linear Regression Using Software Using Regression Results to Predict Future Performance	Osborne, 2000	Hoyt et al., 2008 Thomas, 2021 Rader-Brown & Howley, 2014	

Proposed Semester Schedule				
Date	Topic(s)	Required Reading(s)	Supplemental Readings (Optional)	Assignments
Week 4				
Feb 3rd – Feb 9th	Logistic Regression with a Dichotomous Outcome	Gignac – Chapter 17	Osborne 2012	Multiple Linear Regression Homework
Week 5				
Feb 10th – Feb 16th	Binary Logistic Regression Using Software	Huang & Moon, 2013	Chuang, 1997	
Week 6				
Feb 17th – Feb 23rd	Logistic Regression with Nominal and Ordinal Outcomes	TBD		Dichotomous Logistic Regression Homework

Proposed Semester Schedule				
Date	**Topic(s)**	**Required Reading(s)**	**Supplemental Readings (Optional)**	**Assignments**
Week 7				
Feb 24th – March 2nd	Nominal and Ordinal Logistic Regression Using Software		Moon et al., 2021	Self–Reflection #1
Week 8				
Mar 3rd – Mar 9th	Introduction to Regression and Classification Trees (CART)	King & Resick		Nominal and Ordinal Logistic Regression
Week 9: –				
Mar 10th – Mar 16th	CART Using Software	Seftor et al: IES – CART Resource	Gomes & Almeida	

Proposed Semester Schedule				
Date	**Topic(s)**	**Required Reading(s)**	**Supplemental Readings (Optional)**	**Assignments**
Week 10 Spring Break				
Mar 17th – Mar 23rd				
Week 11				
Mar 24th – Mar 30th	Introduction to Principal Components Analysis, Factor Analysis, and Data Reduction	Gignac – Chapter 15	Osborne, 2015	CART Homework
Week 12				
Mar. 31st – Apr 6th	Principal Components and Factor Analysis Using Software	Watkins, 2018	Costello & Osborne, 2005 Thomas et al., 2022	

	Proposed Semester Schedule			
Date	**Topic(s)**	**Required Reading(s)**	**Supplemental Readings (Optional)**	**Assignments**
Week 13				
Apr 7th – Apr 13th	Introduction to Cluster Analysis	TBD		
Week 14:				
Apr 14th – Apr 20th	Cluster Analysis Using Software			
Week 15				
Apr 21st – April 27th	Single Subjects Designs	TBD		Factor Analysis & Cluster Analysis Homework

Proposed Semester Schedule				
Date	**Topic(s)**	**Required Reading(s)**	**Supplemental Readings (Optional)**	**Assignments**
Week 16: Finals Week				
Apr 28th – May 3rd				Self-Reflection #2 Final Project Both assignments due May 1st