Postgraduate Certificate in EdTech and AI in Education

Research Methods in EdTech

Action Research
Related terms: case study, iterative design, reflective practice.
Explanation: A cyclical method where practitioners identify a problem, implement an intervention, collect data, reflect, and refine the approach.
Example: A teacher modifies a digital quiz platform after each class based on student performance data.
Application: Improves instructional design of learning management systems (LMS) by grounding changes in real-time feedback.
Challenges: Requires time-intensive data collection and may suffer from researcher bias if not carefully documented.

Adaptive Learning
Related terms: personalization, algorithmic tutoring, learner analytics.
Explanation: Technology that adjusts content, pacing, or pathways according to each learner's demonstrated knowledge and skill level.
Example: An AI-driven math app presents easier problems after a series of incorrect answers.
Application: Enhances mastery learning in MOOCs by providing tailored remediation.
Challenges: Designing accurate adaptation algorithms and ensuring equity across diverse learner populations.

A/B Testing
Related terms: split testing, experimental design, statistical significance.
Explanation: A controlled experiment that compares two versions of a digital artifact to determine which performs better on a defined metric.
Example: Testing two layouts of an online discussion forum to see which yields higher participation rates.
Application: Optimizes user interface (UI) elements of educational apps for engagement.
Challenges: Requires sufficient sample size and careful randomization to avoid confounding variables.

Analytics Dashboard
Related terms: learning analytics, data visualization, key performance indicators (KPIs).
Explanation: A visual interface that aggregates and displays metrics such as completion rates, time on task, and assessment scores.
Example: A university's LMS dashboard shows departmental average quiz scores across semesters.
Application: Supports data-driven decision making for curriculum improvement.
Challenges: Overreliance on superficial metrics may mask deeper learning issues; data privacy must be

safeguarded.

Artificial Intelligence (AI)
Related terms: machine learning, natural language processing, intelligent tutoring systems.
Explanation: Computational techniques that enable machines to mimic human cognition, such as pattern recognition, prediction, and language understanding.
Example: An AI chatbot provides instant feedback on short-answer questions.
Application: Automates grading, personalizes content, and predicts student at-risk status.
Challenges: Algorithmic bias, transparency, and the need for large, high-quality training datasets.

Attribution Modeling
Related terms: causal inference, multivariate analysis, conversion tracking.
Explanation: A statistical approach that assigns credit to multiple touchpoints influencing a learner's outcome.
Example: Determining how webinars, email reminders, and in-app notifications collectively affect course completion.
Application: Guides resource allocation for effective learner support interventions.
Challenges: Complex interaction effects and data fragmentation across platforms.

Bayesian Inference
Related terms: prior probability, posterior distribution, hierarchical modeling.
Explanation: A probabilistic framework that updates beliefs about a parameter as new evidence becomes available.
Example: Updating the estimated difficulty of a quiz item after each cohort's responses.
Application: Enables dynamic assessment calibration in adaptive testing.
Challenges: Requires computational expertise and careful selection of priors to avoid misleading results.

Blended Learning
Related terms: hybrid instruction, flipped classroom, synchronous/asynchronous modes.
Explanation: An instructional design that combines face-to-face teaching with digital learning activities.
Example: Students watch recorded lectures online, then engage in in-person problem-solving sessions.
Application: Increases flexibility while preserving social interaction.
Challenges: Aligning online and offline components to avoid redundancy or gaps.

Bloom's Taxonomy
Related terms: cognitive domain, learning outcomes, assessment rubrics.
Explanation: A hierarchical classification of learning objectives ranging from remembering to creating.
Example: Designing a project where learners must synthesize research findings into a novel application.
Application: Guides the development of assessment items aligned with desired cognitive levels.
Challenges: Over-reliance on lower-order skills can limit higher-order thinking opportunities.

Cluster Analysis
Related terms: segmentation, unsupervised learning, k-means.
Explanation: A statistical technique that groups learners based on similarity across multiple variables.
Example: Identifying a cluster of students who frequently access multimedia resources but score low on assessments.
Application: Targets interventions to specific learner sub-populations.
Challenges: Determining the optimal number of clusters and interpreting them meaningfully.

Collaborative Filtering
Related terms: recommendation systems, similarity metrics, user-based filtering.
Explanation: An algorithmic method that suggests items to a learner based on the preferences of similar users.
Example: Suggesting supplemental videos to a student because peers with comparable profiles found them helpful.
Application: Personalizes resource recommendations in digital libraries.
Challenges: Cold-start problem for new users and potential reinforcement of echo chambers.

Content Analysis
Related terms: coding scheme, thematic analysis, qualitative data.
Explanation: A systematic process of categorizing textual or multimedia data to identify patterns or themes.
Example: Coding forum posts to assess the prevalence of self-efficacy statements.
Application: Evaluates affective dimensions of learner interaction.
Challenges: Requires reliable coding protocols and can be time-consuming.

Construct Validity
Related terms: measurement theory, content validity, convergent validity.
Explanation: The degree to which a test accurately measures the theoretical construct it intends to assess.
Example: Validating that a digital game measures problem-solving rather than merely reaction time.
Application: Ensures that research findings reflect genuine learning outcomes.
Challenges: Requires rigorous theoretical grounding and empirical testing.

Curriculum Mapping
Related terms: alignment, learning objectives, instructional design.
Explanation: The process of visually linking standards, objectives, assessments, and instructional activities across a program.
Example: Mapping digital literacy competencies to specific modules in an online teacher-training course.
Application: Identifies gaps and redundancies in program design.
Challenges: Maintaining up-to-date maps as curricula evolve.

Data Triangulation

Related terms: mixed methods, convergence, methodological pluralism.
Explanation: Combining multiple data sources or methods to corroborate findings and enhance credibility.
Example: Merging clickstream logs, survey responses, and interview transcripts to evaluate a learning analytics tool.
Application: Provides a richer, more robust understanding of learner behavior.
Challenges: Integrating disparate data formats and resolving conflicting evidence.

Design-Based Research (DBR)
Related terms: interventionist research, iterative prototyping, theory development.
Explanation: A collaborative approach that designs, implements, and studies educational interventions in real settings to refine theory and practice.
Example: Developing a gamified feedback system, testing it across semesters, and revising design based on emergent data.
Application: Bridges the gap between laboratory research and classroom practice.
Challenges: Managing complexity of real-world contexts and ensuring methodological rigor.

Digital Divide
Related terms: equity, access disparity, broadband availability.
Explanation: The gap between individuals or groups who have adequate access to digital technologies and those who do not.
Example: Rural students lacking high-speed internet experience lower participation in synchronous webinars.
Application: Informs policy decisions on infrastructure investment and inclusive design.
Challenges: Multifaceted nature involving socioeconomic, geographic, and cultural factors.

Ecological Validity
Related terms: external validity, real-world setting, generalizability.
Explanation: The extent to which research findings can be applied to everyday educational environments.
Example: Testing an AI tutor in a lab versus deploying it across multiple schools.
Application: Increases confidence that interventions will function outside controlled settings.
Challenges: Balancing experimental control with authentic contexts.

Effect Size
Related terms: Cohen’s d, standardized mean difference, statistical power.
Explanation: A quantitative measure of the magnitude of a treatment’s impact, independent of sample size.
Example: Reporting that a new interactive module yields a medium effect (d = 0.5) on post-test scores.
Application: Facilitates comparison across studies and informs meta-analysis.
Challenges: Interpreting practical significance and ensuring appropriate calculation.

Ethnography

Related terms: participant observation, cultural analysis, qualitative immersion.
Explanation: An in-depth qualitative method that explores learners' lived experiences within their natural contexts.
Example: Observing how teachers integrate a virtual reality (VR) simulation into daily lessons.
Application: Generates nuanced insights into technology adoption processes.
Challenges: Time-intensive, requires reflexivity, and may raise privacy concerns.

Exploratory Factor Analysis (EFA)
Related terms: latent variables, dimensionality reduction, principal component analysis.
Explanation: A statistical technique used to uncover underlying factor structures among observed variables.
Example: Identifying three latent dimensions—cognitive, affective, and behavioral engagement—from questionnaire items.
Application: Helps refine measurement instruments for EdTech research.
Challenges: Requires large sample sizes and careful interpretation of factor loadings.

Feedback Loop
Related terms: formative assessment, adaptive systems, iterative improvement.
Explanation: A cycle where learner performance data informs immediate instructional adjustments, which in turn generate new data.
Example: An AI tutor provides hints after each incorrect answer, then updates its model of the learner's misconceptions.
Application: Supports personalized learning pathways.
Challenges: Designing timely and pedagogically sound feedback without overwhelming learners.

Flipped Classroom
Related terms: inverted pedagogy, pre-class preparation, active learning.
Explanation: A model where learners first encounter instructional content outside class (e.g., via video) and use class time for applied activities.
Example: Students watch a tutorial on coding syntax at home, then collaborate on debugging exercises in class.
Application: Maximizes higher-order learning during face-to-face sessions.
Challenges: Requires reliable access to pre-class materials and learner accountability.

Framework for Learning Analytics (FLA)
Related terms: data governance, ethical principles, stakeholder model.
Explanation: A structured set of guidelines that outlines the collection, analysis, and use of learning data within an institution.
Example: Implementing a policy that mandates anonymization of student interaction logs before analysis.
Application: Provides a roadmap for responsible analytics deployment.
Challenges: Balancing transparency with privacy, and aligning diverse stakeholder expectations.

Growth Mindset Intervention
Related terms: mindset theory, self-efficacy, attitude change.
Explanation: An instructional strategy designed to foster the belief that abilities can be developed through effort and strategies.
Example: Embedding short videos that emphasize neuroplasticity before a challenging assessment.
Application: Improves resilience and persistence in technology-rich learning environments.
Challenges: Measuring attitudinal shifts and ensuring sustained impact.

Heuristic Evaluation
Related terms: usability testing, cognitive walkthrough, expert review.
Explanation: A usability inspection method where experts assess an interface against established design principles (heuristics).
Example: Evaluating a learning portal for consistency, error prevention, and user control.
Application: Identifies design flaws early in development.
Challenges: Depends on evaluator expertise and may miss context-specific issues.

Hybrid Research Design
Related terms: mixed methods, convergent parallel, explanatory sequential.
Explanation: A research approach that combines quantitative and qualitative components within a single study to leverage strengths of both.
Example: Conducting a survey on learner satisfaction while also holding focus groups to explore underlying reasons.
Application: Provides comprehensive insight into EdTech interventions.
Challenges: Requires careful integration of data strands and expertise in both paradigms.

Human-Centered Design (HCD)
Related terms: user experience (UX), participatory design, empathy mapping.
Explanation: A design philosophy that places learners' needs, contexts, and feedback at the core of technology development.
Example: Co-creating a mobile learning app with students through iterative prototyping sessions.
Application: Increases adoption and effectiveness of educational tools.
Challenges: Time-intensive stakeholder engagement and reconciling divergent user preferences.

Impact Evaluation
Related terms: outcome assessment, longitudinal study, counterfactual.
Explanation: Systematic assessment of the long-term effects of an intervention on targeted outcomes.
Example: Measuring graduate employment rates three years after completing an AI-enhanced curriculum.
Application: Informs policy decisions and funding allocations.
Challenges: Isolating the intervention's effect from external influences and maintaining participant tracking.

Incremental Validity
Related terms: predictive validity, criterion-related validity, hierarchical regression.
Explanation: The extent to which a new measure adds explanatory power beyond existing instruments.
Example: Demonstrating that a digital metacognition tracker predicts final grades above traditional quizzes.
Application: Justifies adoption of novel assessment tools.
Challenges: Requires robust statistical modeling and appropriate comparison baselines.

Infographic Literacy
Related terms: visual communication, data interpretation, multimodal literacy.
Explanation: The ability to decode, interpret, and critically evaluate information presented in infographic format.
Example: Assessing learners' capacity to extract key statistics from a research summary graphic.
Application: Supports development of critical data literacy in digital curricula.
Challenges: Varies with prior visual experience and cultural conventions.

Inter-rater Reliability
Related terms: Cohen's kappa, agreement coefficient, coding consistency.
Explanation: A metric that quantifies the degree of agreement between multiple coders rating the same data.
Example: Achieving a kappa of 0.78 when two researchers code discussion forum sentiments.
Application: Enhances credibility of qualitative analyses.
Challenges: Requires clear coding schemes and training to achieve high agreement.

Iterative Prototyping
Related terms: rapid development, user testing, agile methodology.
Explanation: A cyclical process of creating, testing, and refining a prototype based on user feedback.
Example: Building successive versions of a virtual lab simulation, each incorporating learner suggestions.
Application: Accelerates design improvements and aligns product with learner needs.
Challenges: Managing scope creep and ensuring each iteration is sufficiently evaluated.

Learning Analytics
Related terms: data mining, predictive modeling, educational data science.
Explanation: The measurement, collection, analysis, and reporting of data about learners and their contexts to improve learning.
Example: Predicting dropout risk using attendance, assignment submission, and forum participation data.
Application: Enables early warning systems and targeted support.
Challenges: Data quality, privacy concerns, and interpretation of complex metrics.

Learning Management System (LMS)
Related terms: course delivery platform, SCORM, integration.

Explanation: A software application for the administration, documentation, tracking, reporting, and delivery of educational courses.
Example: Moodle hosting a blended course with quizzes, forums, and gradebooks.
Application: Centralizes instructional resources and learner data.
Challenges: Usability, scalability, and alignment with pedagogical goals.

Learning Style Theory
Related terms: visual/auditory kinesthetic, learner preference, personalization.
Explanation: A contested framework suggesting that individuals learn best when instruction aligns with their preferred sensory modality.
Example: Offering both video and text explanations for a concept.
Application: Often used to justify differentiated resource provision.
Challenges: Empirical support is weak; over-reliance may limit instructional diversity.

Latent Growth Modeling (LGM)
Related terms: longitudinal analysis, structural equation modeling, trajectory analysis.
Explanation: A statistical technique that models change over time at the individual level, capturing both initial status and growth rate.
Example: Tracking students' self-efficacy scores across five semesters to identify distinct growth patterns.
Application: Informs design of interventions that target specific phases of learner development.
Challenges: Requires multiple measurement points and sophisticated software.

Mixed Methods
Related terms: triangulation, convergent design, qualitative-quantitative integration.
Explanation: An approach that deliberately combines both qualitative and quantitative data collection and analysis within a single study.
Example: Surveying 300 learners on satisfaction while conducting 20 in-depth interviews.
Application: Provides a richer, more nuanced understanding of EdTech impacts.
Challenges: Demands expertise in both paradigms and careful timing of data collection phases.

Multimodal Learning Analytics (MMLA)
Related terms: video analytics, eye-tracking, affect sensing.
Explanation: The analysis of data from multiple channels (e.g., audio, video, physiological sensors) to understand complex learning processes.
Example: Using facial expression detection to gauge frustration during a coding task.
Application: Offers deeper insights into affective and cognitive states.
Challenges: Technical integration, data storage, and ethical considerations around biometric data.

Neural Network
Related terms: deep learning, backpropagation, hidden layers.

Explanation: A computational model inspired by the brain's interconnected neurons, capable of learning complex patterns from data.
Example: A convolutional neural network classifies handwritten mathematical symbols.
Application: Powers advanced adaptive assessment and content recommendation systems.
Challenges: Opacity ("black-box" problem), large training data requirements, and computational cost.

Observational Study
Related terms: naturalistic observation, non-experimental design, field research.
Explanation: A research design that records behavior in real-world settings without manipulating variables.
Example: Monitoring how students interact with an AR app during a museum visit.
Application: Captures authentic usage patterns of educational technologies.
Challenges: Limited control over extraneous variables and potential observer bias.

Open Educational Resources (OER)
Related terms: open licensing, Creative Commons, resource sharing.
Explanation: Freely accessible teaching, learning, and research materials that can be adapted and redistributed.
Example: A university adopts a CC-BY textbook for an introductory AI course.
Application: Reduces cost barriers and promotes collaborative content creation.
Challenges: Ensuring quality, sustainability, and alignment with curriculum standards.

Ordinal Scale
Related terms: Likert scale, rank order, non-interval measurement.
Explanation: A measurement scale that reflects relative ordering of items but does not assume equal intervals between points.
Example: Survey items ranging from "Strongly disagree" to "Strongly agree."
Application: Commonly used in attitude and satisfaction questionnaires.
Challenges: Limits the types of statistical analyses that can be performed.

Participatory Design
Related terms: co-creation, stakeholder engagement, design workshops.
Explanation: A collaborative approach where end-users actively contribute to the design process of a technology.
Example: Teachers and students jointly designing the navigation structure of a new LMS module.
Application: Increases relevance and acceptance of EdTech solutions.
Challenges: Managing divergent ideas and ensuring equitable participation.

Pedagogical Content Knowledge (PCK)
Related terms: teacher expertise, instructional strategies, subject matter integration.
Explanation: The intersection of content knowledge and pedagogy, enabling teachers to convey concepts

effectively.
Example: Using a visual metaphor to explain recursion in programming.
Application: Guides professional development for technology-enhanced instruction.
Challenges: Translating PCK into digital formats without loss of nuance.

Personal Learning Environment (PLE)
Related terms: learner agency, tool integration, self-directed learning.
Explanation: A set of tools, resources, and services that learners curate to support their own learning processes.
Example: A student's PLE includes a note-taking app, a curated YouTube playlist, and a citation manager.
Application: Encourages autonomy and lifelong learning habits.
Challenges: Requires digital literacy and may lead to fragmented experiences.

Phenomenography
Related terms: variation theory, qualitative research, experience mapping.
Explanation: A research method that explores the different ways people experience or conceptualize a phenomenon.
Example: Identifying distinct ways teachers perceive the role of AI in assessment.
Application: Informs design of professional development programs.
Challenges: Requires rigorous interview techniques and careful categorization.

Predictive Modeling
Related terms: regression analysis, machine learning, risk scoring.
Explanation: The use of statistical or algorithmic techniques to forecast future outcomes based on historical data.
Example: Predicting which students will achieve proficiency on a digital literacy test.
Application: Enables proactive interventions and resource allocation.
Challenges: Model overfitting, data drift, and interpretability concerns.

Qualitative Coding
Related terms: thematic analysis, grounded theory, codebook.
Explanation: The systematic process of labeling segments of textual or visual data to identify patterns and themes.
Example: Coding chat transcripts for instances of collaborative problem solving.
Application: Provides depth to understanding of learner interactions.
Challenges: Labor-intensive and subject to coder bias.

Randomized Controlled Trial (RCT)
Related terms: experimental design, control group, random assignment.
Explanation: A study where participants are randomly allocated to either an intervention or a comparison

condition to assess causal effects.
Example: Randomly assigning half of a cohort to receive an AI-driven tutoring system and half to a traditional textbook.
Application: Generates high-quality evidence on EdTech efficacy.
Challenges: Ethical considerations, logistical complexity, and participant attrition.

Rasch Modeling
Related terms: item response theory, measurement invariance, difficulty calibration.
Explanation: A probabilistic model that estimates both item difficulty and learner ability on a common scale.
Example: Calibrating quiz items so that a score of 70 indicates mastery of the underlying skill.
Application: Supports adaptive testing and fair assessment across diverse learners.
Challenges: Requires unidimensionality and sufficient response data.

Reflective Practice
Related terms: metacognition, professional learning, self-assessment.
Explanation: The habit of continuously analyzing one's own teaching actions to improve future performance.
Example: An instructor reviews analytics dashboards after each session to adjust pacing.
Application: Promotes continuous improvement in technology integration.
Challenges: Time constraints and need for supportive feedback mechanisms.

Remote Proctoring
Related terms: online invigilation, identity verification, privacy concerns.
Explanation: The use of technology to monitor exam takers remotely to ensure academic integrity.
Example: Using webcam and AI-based facial recognition to detect cheating during an online final.
Application: Enables secure assessment in fully digital courses.
Challenges: Balancing security with student privacy and accessibility.

Research Ethics Board (REB)
Related terms: Institutional Review Board (IRB), consent, data protection.
Explanation: A committee that reviews research proposals to ensure ethical standards are met, especially regarding human participants.
Example: Obtaining approval before collecting clickstream data from learners.
Application: Safeguards participant rights and institutional compliance.
Challenges: Navigating lengthy approval processes and evolving data regulations.

Response Time Analysis
Related terms: latency measurement, cognitive load, interaction logging.
Explanation: Examining the interval between a learner's stimulus and their response to infer processing difficulty.
Example: Measuring longer response times on complex problem-solving items in a digital quiz.

Application: Identifies concepts that may require additional scaffolding.
Challenges: Requires precise timestamp synchronization and may be confounded by external distractions.

Scalable Learning Analytics
Related terms: big data, cloud computing, real-time processing.
Explanation: Techniques that allow analytics to handle large volumes of learner data efficiently.
Example: Deploying a distributed processing pipeline to analyze millions of interaction events nightly.
Application: Supports institution-wide dashboards and early-warning systems.
Challenges: Infrastructure costs, data governance, and ensuring algorithmic fairness at scale.

Self-Efficacy
Related terms: Bandura, confidence, motivation.
Explanation: An individual's belief in their capability to execute tasks and achieve goals.
Example: Learners with high self-efficacy persist longer on challenging coding exercises.
Application: Predictor of engagement and performance in technology-rich environments.
Challenges: Measuring accurately and distinguishing from related constructs like self-esteem.

Sentiment Analysis
Related terms: natural language processing, affect detection, opinion mining.
Explanation: Computational technique that determines the emotional tone behind textual data.
Example: Analyzing forum posts to gauge student satisfaction with a new LMS feature.
Application: Provides rapid feedback on learner attitudes.
Challenges: Contextual nuance, sarcasm detection, and language diversity.

Sequential Mixed Methods
Related terms: explanatory sequential, exploratory sequential, phased design.
Explanation: A mixed-methods approach where one data collection phase follows another, informing subsequent steps.
Example: Conducting a survey first, then using its results to design focus-group questions.
Application: Allows refinement of instruments based on preliminary findings.
Challenges: Extended timelines and need for flexible research planning.

Simulation-Based Learning
Related terms: virtual labs, scenario-based training, immersive environments.
Explanation: Educational experiences that replicate real-world processes through interactive digital models.
Example: A virtual chemistry lab where students conduct experiments without hazardous materials.
Application: Provides safe, repeatable practice for complex skills.
Challenges: High development costs and ensuring fidelity to authentic tasks.

Social Network Analysis (SNA)

Related terms: graph theory, centrality, community detection.
Explanation: A method for mapping and measuring relationships and flows between people, groups, or entities.
Example: Visualizing peer-to-peer communication patterns in an online discussion forum.
Application: Identifies influential learners and potential collaboration gaps.
Challenges: Data privacy, dynamic network changes, and interpretation of structural metrics.

Software Usability Testing
Related terms: think-aloud protocol, task completion, error rate.
Explanation: Systematic evaluation of how easily users can learn and use a software product to achieve specific goals.
Example: Observing students as they navigate a new e-portfolio platform while verbalizing their thoughts.
Application: Informs iterative improvements to interface design.
Challenges: Recruiting representative participants and capturing authentic usage contexts.

Standardized Assessment
Related terms: norm-referenced, criterion-referenced, psychometrics.
Explanation: An evaluation administered and scored in a consistent manner across different settings.
Example: A national computer-science proficiency test delivered online.
Application: Facilitates comparison of learner performance across institutions.
Challenges: Aligning test items with diverse curricula and ensuring cultural fairness.

Statistical Power
Related terms: effect size, sample size, Type II error.
Explanation: The probability that a test will correctly reject a false null hypothesis, i.e., detect a true effect.
Example: A study with 80% power to detect a medium effect of a new gamified assignment.
Application: Guides sample size calculations for EdTech experiments.
Challenges: Balancing power with resource constraints and ethical considerations of participant recruitment.

Student-Generated Content (SGC)
Related terms: peer teaching, crowdsourcing, collaborative authoring.
Explanation: Learning materials created by learners themselves, often shared within a community.
Example: Students produce tutorial videos on using a new data-visualization tool.
Application: Enhances deep learning and builds digital portfolios.
Challenges: Quality control and ensuring alignment with learning objectives.

Survey Instrument Validation
Related terms: construct validity, reliability, pilot testing.
Explanation: The process of confirming that a questionnaire accurately measures the intended constructs and yields consistent results.

Example: Conducting a factor analysis to confirm that items load onto intended dimensions of digital competence.
Application: Increases confidence in data collected for EdTech research.
Challenges: Requires iterative refinement and sufficient respondent numbers.

Technology Acceptance Model (TAM)
Related terms: perceived usefulness, perceived ease of use, behavioral intention.
Explanation: A theoretical framework that predicts user adoption of technology based on perceived benefits and effort.
Example: Using TAM to assess faculty willingness to adopt a new analytics dashboard.
Application: Guides change management strategies for EdTech deployment.
Challenges: May oversimplify complex motivational factors and cultural influences.

Thick Description
Related terms: contextualization, ethnography, interpretive analysis.
Explanation: Detailed narrative that situates observations within their broader social and cultural context.
Example: Providing a vivid account of how learners interact with an AR field-trip in a rural school.
Application: Enhances transferability of qualitative findings.
Challenges: Requires extensive fieldwork and narrative skill.

Time-Series Analysis
Related terms: autoregressive models, trend detection, seasonality.
Explanation: Statistical techniques for analyzing data points collected sequentially over time to identify patterns.
Example: Examining weekly login frequencies to detect seasonal dips in platform usage.
Application: Informs scheduling of interventions and resource planning.
Challenges: Requires consistent data collection intervals and handling of autocorrelation.

Transferability
Related terms: external validity, generalization, contextual relevance.
Explanation: The extent to which research findings can be applied to other settings, populations, or times.
Example: Assessing whether results from a pilot AI tutoring study in one university hold for community colleges.
Application: Supports scaling decisions for EdTech innovations.
Challenges: Differences in infrastructure, learner demographics, and institutional culture may limit applicability.

Triangulation
Related terms: methodological convergence, data source diversity, validation.
Explanation: The use of multiple methods or data sources to cross-verify findings and strengthen credibility.

Example: Combining clickstream analysis, survey responses, and interview data to evaluate a new LMS feature.
Application: Reduces bias and enhances robustness of conclusions.
Challenges: Requires careful coordination and synthesis of heterogeneous data.

Usability Heuristics
Related terms: Nielsen's ten heuristics, user experience, design principles.
Explanation: General rules of thumb for evaluating the ease of use and efficiency of an interface.
Example: Checking that error messages are clearly displayed and offer constructive solutions.
Application: Guides rapid assessment of educational software.
Challenges: Heuristics are generic and may need adaptation for specific learning contexts.

Validity Threats
Related terms: construct drift, instrumentation, selection bias.
Explanation: Factors that can compromise the accuracy of inferences drawn from research data.
Example: Participants dropping out disproportionately from the control group, threatening internal validity.
Application: Informs rigorous study design and interpretation.
Challenges: Identifying and mitigating multiple concurrent threats.

Video Analytics
Related terms: facial expression detection, gaze tracking, engagement metrics.
Explanation: The extraction of meaningful data from video recordings to assess learner behavior and affect.
Example: Measuring head nods as a proxy for comprehension during a recorded lecture.
Application: Provides real-time feedback to instructors on student engagement.
Challenges: Privacy concerns, processing overhead, and accuracy of affect detection algorithms.

Virtual Reality (VR) Pedagogy
Related terms: immersive learning, presence, spatial cognition.
Explanation: Instructional strategies designed to leverage the unique affordances of VR environments for learning.
Example: A VR anatomy lab where students manipulate 3-D models of the human heart.
Application: Enhances spatial reasoning and experiential learning.
Challenges: High hardware costs, motion sickness, and designing curriculum-aligned experiences.

Weighted Least Squares (WLS)
Related terms: regression analysis, heteroscedasticity, estimation technique.
Explanation: A regression method that assigns different weights to observations to account for varying variance.
Example: Applying WLS to model student scores where variance differs across proficiency levels.
Application: Improves model accuracy when assumptions of ordinary least squares are violated.

Challenges: Determining appropriate weights and ensuring model stability.

Wikis as Learning Platforms
Related terms: collaborative authoring, knowledge construction, community of practice.
Explanation: Online environments that allow multiple users to create, edit, and organize content collectively.
Example: A course-wide wiki where students co-author summaries of research articles.
Application: Fosters collective knowledge building and digital literacy.
Challenges: Monitoring content quality and managing edit conflicts.

Zero-Inflated Models
Related terms: count data, overdispersion, hurdle model.
Explanation: Statistical models that account for excess zeros in count data by modeling the zero-generating process separately.
Example: Modeling the number of times students access a supplemental resource, where many never access it.
Application: Provides more accurate estimates of usage patterns in EdTech adoption studies.
Challenges: Model complexity and interpretation of dual processes.