1 Protocol Title

Academy Innovations Research Project: An Examination of Integrative Curricular Design and Retention Intervals in the Police Academy Setting

2 Background and Objectives

Background: The Academy Innovations project, supported by the U.S. Department of Justice COPS Office, is designed to develop evidence-based training methods for law enforcement. By partnering with law enforcement training academies on academy-driven experiments, the program aims to identify improved methodologies for the delivery of basic law enforcement training content.

Purpose: The purpose of this project is to assist academies in measuring and evaluating student knowledge and retention of Communication Skills based on the delivery method of instruction during a basic academy training.

Literature: The literature examining integrated content delivery and information retention intervals in police training is underdeveloped. This study will contribute to the literature by evaluating the impact of an integrated content delivery approach in both in-person and online contexts. This will broaden existing general research on integrated content delivery and retention intervals and address significant gaps in the police-specific literature. Furthermore, the study will also allow the evaluation of retention intervals in in-person and online police learning contexts. Online learning retention intervals are underrepresented in the existing literature, and this study represents a significant addition to both general online learning research and police-specific learning research.

A review of available literature suggested the concept of “integrated curriculum” generally describes a multitude of innovations designed to organize learning material in a way that combines subjects that are typically taught separately (Harden, Sowden, and Dunn, 1984; Brauer and Ferguson, 2015; Panitz, 1997; Loepp, 1999; Shoemaker, 1989; Kysilka, 1998). Integrating curriculum appeared to provide learners with beneficial problem-solving skills, intellectual curiosity, improved attitude toward schooling, and higher achievement (Malik and Malik, 2011; Wolf and Brandt, 1998; Snyder, 2001). Additionally, participating in an integrated curriculum positively impacted performance on knowledge measurements (Tarr, Grouws, Chavez, and Soria, 2013). Alternatively, the literature included several drawbacks to the integrated approach including a higher burden on teachers, unclear boundaries between disciplines, and redundant or overlapping subject matter areas (Wolf and Brandt, 1998; Atta, El-Hag, Shafek, Al-Ghamdi, and Al-Ghamdi, 2020; Muthukrishnan, Peraman, Palaian, Parasuraman, and Zakirul, 2006; Hatch, 1998).

The literature indicated that long retention intervals produced worse performance than short retention intervals (Driskell, Copper, and Willis, 1992). First, various studies examined the effect of interval length on skill sustainment and concluded that longer retention intervals were associated with poorer performance (Schendel and Hagman 1980; Goldberg, Drillings, and Dressel, 1981; Van Dusen and Schlosberg, 1948; Leonard, Wheaton, and Cohen, 1976; Youngling, Sharpe, Ricketson, and McGee, 1968). Similarly, the literature also suggested that long retention intervals produced worse performance than short retention intervals with respect to knowledge sustainment, particularly of recall-related information (Semb and Ellis, 1994; Semb, Ellis, and Araujo, 1993; Halpin and Halpin, 1982; Glasnapp, Poggio, and Ory, 1978; Conway, Cohen, and Stanhope, 1991; MacKenzie and White, 1982).

Specific to police training, Kratzig (2016) investigated retention of shooting proficiency based on the pistol training program of the Royal Canadian Mounted Police (RCMP). Study results indicated that longer periods of training resulted in better retention of motor skills than did training of shorter duration, independent of the number of practice trials achieved during training sessions. Furthermore, students who participated in longer periods of training performed better across all retention intervals. Compton and Chien (2008) investigated knowledge retention in a group of 88 officers assigned to a crisis intervention team in Georgia. Using a knowledge test followed by a similar test approximately 46 weeks later, the study indicated years of police service, not retention interval, was a significant predictor of knowledge retention. Specifically, officers with 2-14 years of experience had a greater decline in

performance from initial test to follow-up test than officers with 15-35 years of experience irrespective of duration between initial and follow-up tests.

Finally, the literature indicated police organizations around the world implemented online training capabilities in the basic academy and in-service contexts and generally supported the use of online learning to train law enforcement officers (Seth, 2013; Brand and Mahlke, 2017; Yuniawati, Fakhruddin, and Rusdarti, 2021; Chimusoro, 2019; Lepatski, 2011). The scope of online learning use by United States law enforcement agencies is unclear, but several studies examined the efficacy of online training involving American police officers. Donavant (2007) examined the efficacy of distance learning for delivering professional development content to police officers in Florida and concluded that a pre- and post-test comparison of classroom and online learning revealed no statistically significant difference in effectiveness. Donavant (2009) also examined potential for online learning success in police officers from 42 agencies in Tennessee and found that online learning success was significantly related to age and education level. With respect to online training and retention intervals, Edwards, Rule, and Boody (2017) examined knowledge retention of mathematical concepts over a two-year interval and did not identify significant differences between retention of materials delivered online or in-person. In contrast, Deatz and Trippe (2012) assessed knowledge retention for online and classroom boating safety courses and obtained statistically significant differences in mean scores between online and classroom training, with online participants faring slightly worse than classroom participants.

Research Questions: This study will examine student knowledge and retention (dependent variable) of communication skills by delivery method (independent variables) within basic academy training. The first delivery method is content delivered through traditional lecture instruction and the second delivery method is content delivered through an integrated, correlated approach. Both delivery methods will have an online and in-person group to further examine the impacts of content delivery medium. The study will focus on the following research questions:

RQ1: Within a retention interval of 90 days, does an integrated content delivery approach including correlated lessons at two 30-day intervals positively impact student knowledge?

RQ2: Does content delivery medium (online or in-person) impact student knowledge of content delivered with an integrated content delivery approach, including correlated lessons at two 30-day intervals?

Hypotheses:

Null Hypothesis: An integrated content delivery approach with correlated lessons has no impact on student knowledge and retention.

H1: Participation in an integrated content delivery approach with correlated lessons will have a positive impact on student knowledge and retention when compared to participation in a traditional lecture.

H2: Participation in an in-person content delivery approach will have a positive impact on student knowledge and retention when compared to participation in an online content delivery approach.

H3: Participation in an in-person content delivery approach with correlated lessons will have a positive impact on student knowledge and retention when compared to participation in a traditional lecture.

3 Data Use

This data and associated analysis will be used for four purposes. First, participating academies have agreed to this research as part of a national effort to improve police training. Outcomes may be used to inform future academy instruction, course development, and student evaluation. Next, this research will be used to support government reporting required by cooperative agreement 2020CKWXK049. Third, results of this research will be presented in both academic and practitioner forums as well as association conferences. The Project Team and academies involved in this study are seeking to inform other agencies and programs of lessons learned regarding the development of effective and efficient police training programs. Finally, all results of this research will be released to police training

academies and other criminal justice training organizations to support programs and strategic plans for improving police training course development, instruction, and student evaluation. Data and final analysis variables will be archived in the National Archive of Criminal Justice Data (NACJD).

4 Inclusion and Exclusion Criteria

This study includes the recruitment of police recruits from two state law enforcement academies, one large municipal police agency academy, and two, two-year colleges that certify police officers. The following special populations will be excluded:

- Minors (individuals who are under the age of 18)
- Adults who are unable to consent
- Prisoners
- Undocumented individuals

5 Datasets

There are six data sets for this study:

Dataset 1: Student demographic and educational history data
This data source includes non-descript demographics (gender, race/ethnicity, age) of the student, location information (academy location), categorical variables on educational achievement history (highest level of education attainment, professional certifications), and categorical variables on prior police and military employment (total years of prior military experience, total years of prior law enforcement experience). All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

Dataset 2: Per question results for a pre-test
This data source includes per-question, per-student testing data on a 25-item multiple choice test delivered prior to initial Communication Skills lesson delivery. All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

Dataset 3: Per question results for an interval-test
This data source includes per-question, per-student testing data on a 25-item multiple choice test delivered following initial lesson delivery. All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

Dataset 4: Per question results for an interval-test
This data source includes per-question, per-student testing data on a 15-item multiple choice test delivered following integrated content intervention 1. All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

Dataset 5: Per question results for an interval-test
This data source includes per-question, per-student testing data on a 15-item multiple choice test delivered following integrated content intervention 2. All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

Dataset 6: Per question results for a post-test

This data source includes per-question, per-student testing data on a 25-item multiple choice test delivered 90 days after initial lesson delivery. All names, or references to names, are excluded from data received by the Project Team for the purposes of this study.

All data is pertaining to adults over the age of 18 years of age who are able to provide consent via informed consent letter (Attachment 1).

6 Number of Participants

This study includes the recruitment of police recruits from two state academies, one large municipal agency academy, and two, two-year colleges that certify police officers. Per each academy, the following police recruits (estimated totals, anticipated N=190) will be recruited for this study:

- State Peace Officer Standards and Training (POST) of Nevada – 30 Recruits
- State Police Officer Standards and Training (POST) of New Mexico – 60 Recruits
- Baltimore Police Academy of Baltimore, MD – 50 Recruits
- Collin College Law Enforcement Academy of McKinney, TX – 30 Recruits
- Wake Technical Community College Public Safety Training Academy of Raleigh, NC – 20 Recruits

7 Recruitment Methods

Staff from the five participating academies will be responsible for recruiting study participants. Participating academies selected one basic police training course to participate in this project. These courses start on the following days:

- Wake Technical Community College Public Safety Training Academy of Raleigh, NC – Course Start Date: July 12, 2021.
- Baltimore Police Academy of Baltimore, MD – Course Start Date: August 16, 2021.
- Collin College Law Enforcement Academy of McKinney, TX – Course Start Date: October 25, 2021.
- State Police Officer Standards and Training (POST) of New Mexico – Course Start Date: January 23, 2022.
- State Peace Officer Standards and Training (POST) of Nevada – Course Start Date: Jan 31, 2022.

On or about these course start dates academy staff members will present a short video that defines the Academy Innovations project (Attachment 2) and answer questions about the project. Academy staff will then request consent from participants via informed consent letter and will retain all signed forms in a locked cabinet.

8 Procedures Involved

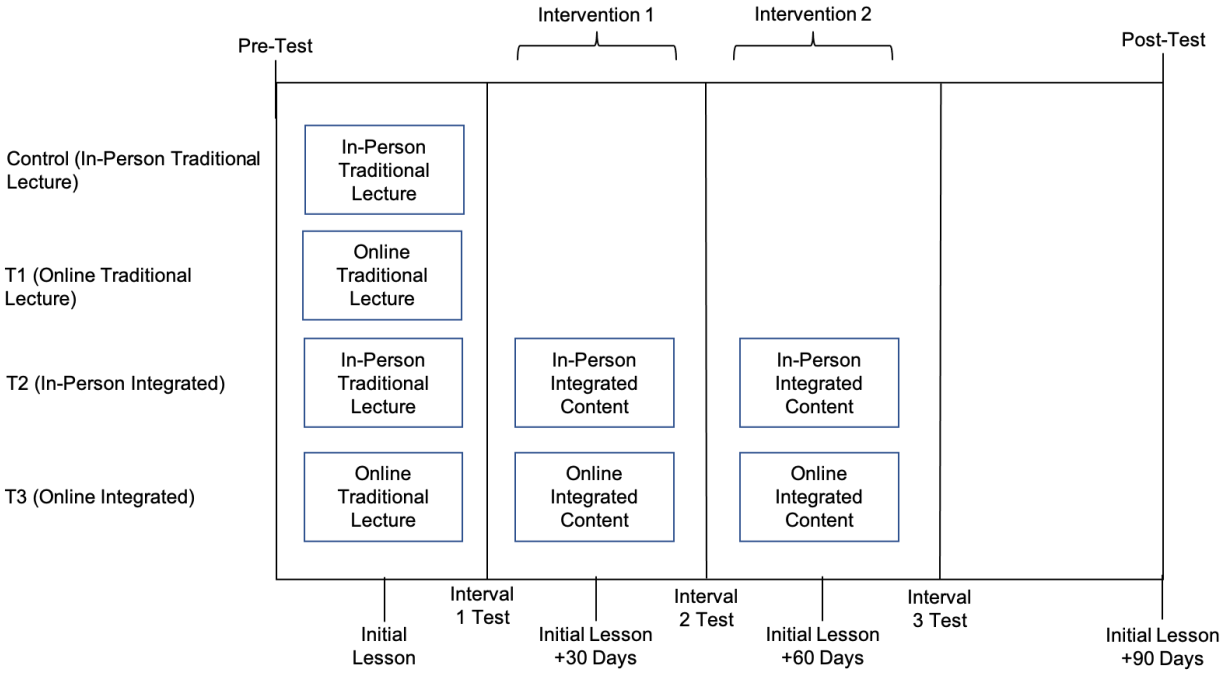
This project includes one randomized controlled trial (RCT) of approximately 190 police recruit learners' knowledge retention of communication skills. The Project Team will randomly generate four populations, with two populations containing 47 participants and two populations containing 48 participants. Knowledge retention will be measured from student scores on a written pre-test delivered prior to the delivery of an initial Communication Skills lesson, a written test delivered immediately following the initial Communication Skills lesson, a written test delivered immediately after an integrated content lesson at initial lesson +30 days, a written test delivered immediately after an integrated content lesson at initial lesson +60 days, and a written post-test delivered at approximately initial lesson +90 days. Figure 1 presents the RCT design:

Figure 1: RCT Design

		Content Delivery Approach	
		Traditional Lecture	**Integrated**
Content Delivery Medium	In-Person	Control (N=47)	T2 (N=47)
	Online	T1 (N=48)	T3 (N=48)

Figure 2 presents the proposed experimental process:

Figure 2: Experimental Process



The Project Team will conduct an interrupted time series analysis to compare pre-, interval- and post-knowledge tests to measure impacts to student learning and retention for in-person and online experimental groups and in-person and online control groups. The pre-test will capture baseline knowledge of communication skill concepts for all participants. Following the pre-test, the Project Team will deliver a basic Communication Skills module to all experimental groups. T0 (Control) and T2 (In-Person Integrated) will receive the lesson via in-person instruction from the Project Team, while T1 (Online Traditional Lecture) and T3 (Online Integrated) will receive the lesson via online instruction from the Project Team.

Interval 1 Test will capture immediate knowledge capture and improvement from all participants immediately after the delivery of the Communication Skills module. This interval-test will capture a secondary baseline. Interval 2 Test (Attachment 3) will capture knowledge capture and improvement from all participants immediately after the delivery of Intervention 1, Integrated Content Delivery, to the experimental groups. Interval 3 Test (Attachment 4) will measure knowledge capture and improvement from all participants immediately after the delivery of Intervention 2, Integrated Content Delivery, to the experimental group. The post-test, delivered at approximately Initial Lesson +90 days, will

capture knowledge retention of the content for all participants. Pre-Test, Interval 1 Test, and Post-Test will include 25 semi-randomized questions from a test bank of 58 questions (Attachment 5). The test bank contains questions that correspond with seven learning objectives addressed in foundational "Communication Skills" content.

Academy staff will input all results from these written exams into a Qualtrics survey form. Qualtrics is a secure online data collection and survey platform that complies with government information security guidelines and data encryption requirements per ISO 27001 certification and FedRAMP/NIST 800-53. Forms will capture per question, per student testing data and will not contain personally identifiable information. To examine the effects of interventions, segmented regression will be used. Multivariable regression will be employed to adjust for possibly measured confounding by controlling for educational attainment and policing experience. For all statistical tests, a P value of <0.05 will be considered statistically significant.

9 Compensation or Credit

Participants will not receive any compensation or credit.

10 Risk to Participants

There are no foreseeable risks to this study. This study seeks to obtain results that will aid in the improvement of police training efforts.

11 Potential Benefits to Participants

Participation does not provide any direct benefits to individual participants.

12 Privacy and Confidentiality

To protect participants' privacy interests, all data collected within this study will be secondary data. Academies will assign each consenting participant a unique numeric identifier and maintain a master list with names of participants and their corresponding identifiers. Data will be tracked via assigned numeric identifier. The Project Team will not have access to master lists.

Academy staff will be responsible for the collection of all individual-level data (e.g., demographics, education, testing scores) for participants and providing all data points to the Project Team via Qualtrics. The use of Qualtrics for data collection in this study will ensure that personally identifiable information not allowed to be collected during this study (e.g., participant name) will not occur due to data entry and/or data transference. Furthermore, the use of Qualtrics will ensure that all data transmitted will be dual encrypted and meet information security requirements.

All data captured in Qualtrics will be exported and stored in an encrypted folder for the Project Team. The Project Team will create and maintain encrypted, password-protected cloud storage folders to transfer data between Project Team members. Access to this folder will be limited to Project Team members. At rest, all files will be encrypted using 256-bit Advance Encryption Standard (AES). In transit between team members, all files will be sent using Secure Sockets Layer (SSL)/Transport Layer Security (TLS). If required, local machines will be used to access project data. All data access on local machines will be conducted from a password protected user profile. No data will be stored on a local machine; at the conclusion of access from a local machine, all products and data will be uploaded to an encrypted, password protected cloud storage folder.

The Project Team will access files through two-factor authentication. IADLEST will retain data for a period of 3 years from project completion or until all litigation, claims, or audit findings involving data have been resolved and final action taken, whichever is later.

Please see Data Management Plan (Attachment 6) for additional information.

13 Consent Process

The Project Team has received consent from each participating academy. Additional consent per participant via informed consent letter will be obtained by academy staff prior to study. On or about course start dates, academy staff members will present a short video that defines the Academy Innovations project and answer questions about the project. Academy staff will then request consent from participants via informed consent form and will retain all signed forms in a locked cabinet (Reference Paragraph 7 for additional information).

14 Training

The following members of the Project Team have completed CITI training for human participants:

TIMOTHY BONADIES, Human Research – Group 2: Social & Behavioral Research, 1 Mar 19, CITI#21277461
TIMOTHY BONADIES, Responsible Conduct of Research – Humanities, 19 Mar 19, CITI#25097995
TIMOTHY BONADIES, Conflicts of Interest, 1 Mar 19, CITI#25060346

15 References

Atta, I., El-Hag, M., Shafek, S., Al-Ghamdi, H., and Al-Ghamdi, T. (2020). Drawbacks in the implementation of an integrated medical curriculum at medical schools and their potential solutions. *Education in Medicine Journal. 2020, 12(1*), 29–42. https://doi.org/10.21315/eimj2020.12.1.4

Brand, M. & Mahlke, K. (2017, September 20-22). *DNR and the use of blended learning methodology in German police education* [Paper Presentation]. Advances in Web-Based Learning - ICWL 2017: 16th International Conference, Cape Town, South Africa.

Brauer, D., & Ferguson, K. (2015). The integrated curriculum in medical education: AMEE Guide No. 96. *Medical Teacher, 37,* 312-322.

Chimusoro, E. (2019). Effectiveness of e-learning in enhancing police performance: Case of criminal investigation department headquarters. Unpublished thesis, Bindura University of Science Education, Zimbabwe.

Compton, M. and Chien, V. (2008). Factors related to knowledge retention after crisis intervention team training for police officers. *Psychiatric Services, 59(9),* 1049-1051.

Conway, M., Cohen, G., and Stanhope, N. (1991). On the very long-term memory of knowledge acquired at school and university. *Applied Cognitive Psychology, 6*, 467-482.

Deatz, R. and Trippe, D. (2012). Assessing knowledge retention for online and classroom boating safety courses. Grant report produced under a grant from the Sport Fish Restoration and Boating Trust Fund.

Donavant, B. (2007). Efficacy of distance learning for professional development of police officers. Unpublished doctoral dissertation, University of Southern Mississippi, Hattiesburg.

Donavant, B. (2009). To internet or not?: Assessing the efficacy of online police training. *American Journal of Criminal Justice, 34,* 224-237.

Edwards, C., Rule, A., & Boody, R. (2017). Middle School Students' Mathematics Knowledge Retention: Online or Face-to-Face Environments. *Journal of Educational Technology & Society, 20*(4), 1-10.

Glasnapp, D., Poggio, J., and Ory, J. (1978). End-of-course and long-term retention outcomes for mastery and nonmastery learning paradigms. *Psychology in the Schools, 15*, 595-603.

Goldberg, S., Drillings, M. and Dressel, D. (1981). Mastery training: Effect on skill retention. U.S. Army Research Institute for the Behavioral and Social Sciences, Technical Report 513.

Halpin, G. and Halpin, G. (1982). Experimental investigation of the effects of study and testing on student learning, retention, and ratings of instruction. *Journal of Educational Psychology, 74*, 32-38.

Harden, R., Sowden, S., and Dunn, W. (1984). Some educational strategies in curriculum development: The SPICES model. ASME Medical Education Booklet number 18. *Medical Education; 18*, p. 284–297.

Hatch, T. (1998). The differences in theory that matter in the practice of school improvement. *American Educational Research Journal 35(1),* 3–31.

Kratzig, G. (2016). Skill retention: A test of the effects of overlearning and skill retention interval on maintenance of infrequently used complex skills. Unpublished doctoral dissertation, University of Regina.

Kysilka, M. (1998). Understanding integrated curriculum. *The Curriculum Journal; 9(2)*, 197-209.

Leonard, R., Wheaton, G., and Cohen, F (October 1976). *Transfer of training and skill retention* (TR-76-A3). Washington, DC: American Institute for Research.

Loepp, F. (1999). Models of curriculum integration*. The Journal of Technology Studies, 25(2),* 21-25.

MacKenzie, A. and White, R. (1982). Fieldwork in geography and long-term memory. *American Educational Research Journal, 19,* 623-632.

Malik, A. & Malik, R. (2011). Twelve tips for developing an integrated curriculum. *Medical Trainer, 33,* 99-104.

Muthukrishnan, R., Peraman, R., Palaian, S., Parasuraman, S., and Zakirul, M. (2016). Challenges and opportunities in integrated curriculum of health professions education – A critical view. *Indian Journal of Pharmaceutical Education and Research. 50,* 502-503. 10.5530/ijper.50.3.26.

Panitz, B. (1997). The integrated curriculum. *ASEE Prism, 7*(1), 24-29.

Schendel, J. and Hagman, J. (1980). On sustaining procedural skills over prolonged retention intervals. U.S. Army Research Institute for the Behavioral and Social Sciences, Research Report 1298.

Semb, G., & Ellis, J. (1994). Knowledge Taught in School: What Is Remembered? *Review of Educational Research, 64*(2), 253-286. doi:10.2307/1170695

Semb, G., Ellis, J., and Araujo, J. (1993). Long-term retention of knowledge learned in school. *Journal of Educational Psychology, 85*, 305-316.

Seth, V. (2013). The role of ICT: A case of the police force of India. *International Journal of Advanced Research in Computer Science and Software Engineering, 3(ii),* p. 778-781.

Shoemaker, B. (1989). Integrative education: A curriculum for the twenty-first century. *OSSC Bulletin, 33(2)*.

Snyder, S. (2001). Connection, Correlation, and Integration. *Music Educators Journal, 87*(5), 32-70. doi:10.2307/3399706

Tarr, J., Grouws, D., Chavez, O., and Soria, V. (2013). The effects of content organization and curriculum implementation on students' mathematics learning in second-year high school courses. *Journal for Research in Mathematics Education, 44(4),* 683-729.

Van Dusen, F. and Schlosberg, H. (1948). Further study of the retention of verbal and motor skills. *Journal of Experimental Psychology, 38*, 526–534.

Wolf, P. and Brandt, R. (1998). What do we know from brain research? *Educational Leadership, 49(2),* 14-15.

Youngling, E. W., Sharpe, E. N., Ricketson, B. S., & McGee, D. W. (December 1968). Crew skill retention for space mission up to 200 days (F7666). McDonnell-Douglas Astronautics, Eastern Division.

Yuniawati, E., Fakhruddin, Rusdarti & Kardoyo. (2021). Development of e-learning management model for teaching system at the police academy. *Turkish Journal of Computer and Mathematics Education*, *12(5),* p. 188-196.