IDENTIFYING FACTORS IMPACTING THE INTENTION TO USE VIDEOS OF AUTHENTIC PATIENT ENCOUNTERS BY EMS EDUCATORS

by

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DEDICATION

Completing this could not have been possible without the participation and assistance of so many people whose names I cannot enumerate. Their contributions are appreciated and acknowledged. However, I would like to express my appreciation to the following:

It is with gratitude and warm regard I dedicate my work to my family and closest friends. To my loving parents, William and Darlene Martin, whose words of encouragement and push for tenacity still resound with me today. To my brother Jordan, who has always been supportive and quietly proud. In memory of my paternal grandparents, Randall and Cornelia Martin, who were loving and dedicated to all of their grandchildren. In memory of my maternal grandmother, Edith Hyde, who always had faith in my success. To my best friend, Dr. Michael Hubble, who has been my professional mentor for more than two decades. Finally, to Penny, Minnie, Mork and Mindy, my furry writing companions. Each of you have been my cheerleader, friend, inspiration, and support.

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ABSTRACT

The cornerstones of prehospital provider education include didactic instruction, psychomotor skills training, and hospital and ambulance clinical rotations. Increasing enrollment in healthcare education programs, limited clinical opportunities, and an increasingly technologically savvy student body are compelling educators to pursue supplementary techniques for teaching and learning. Although high fidelity simulators are becoming increasingly commonplace, other educational technologies are less widely adopted. Concomitantly, little research has been conducted exploring rationale and motivating factors for adoption and utilization of technology by EMS educators. Videos of authentic patient encounters recorded in clinical settings (VAPE) have the potential to provide students an opportunity to learn applicable content in a safe and controlled learning environment.

The integration of various educational video modalities into curriculum has been shown to increase student engagement and motivation in other settings but has not been studied within the prehospital education environment. This research is designed to investigate the behavioral intention and use of VAPE by EMS program faculty and staff.

A cross-sectional survey design of an extended version of the Technology Adoption Model will be employed to collect participant data. The TAM model was extended to include prior experience, technological competency, social norms, and characteristics of personality as determined by the Five Factor Model (FFM). Study participants included academic professionals who are currently working with or teaching for an accredited prehospital EMS education program and are involved in the design or instruction of curriculum. An online survey assessing attitude, prior experience, technological competency, social norms, and personality were sent to faculty and staff of currently accredited EMS education programs. Participants received the questionnaire electronically and had access to complete the survey at their convenience.

A total of 148 completed surveys were included in the analysis. The sample was largely male (71.1%) with an average age of 48.9 years, with a main personality trait of conscientiousness (31%). Factor analysis resulted in the inclusion of 7 factors; perceptions of utility, stability, agreeableness, extraversion, conscientiousness, technological competency, and prior experience. A path analysis determined Factor 1: Perceptions of Utility had a strong positive impact on intention to use VAPE by EMS educators. Thematic analysis identified VAPE as a means to meet the educational needs of faculty and students and improve student learning. However, challenges to adoption were also identified and included cost, as well as administrative and technical support.

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LIST OF ABBREVIATIONS

BSU	Boise State University
CoAEMP	Committee on Accreditation of EMS Programs
DOT	Department of Transportation
EMS	Emergency Medical Services
FFM	Five Factor Model
GC	Graduate College
NHTSA	National Highway Traffic Safety Administration
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
SEM	Structural Equation Modeling
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
TDC	Thesis and Dissertation Coordinator
UTAUT	Unified Theory of Acceptance and Use of Technology
VAPE	Videos of authentic patient encounters

CHAPTER ONE: INTRODUCTION

Prehospital emergency medical service (EMS) educators have a responsibility to ensure their students are competent to treat patients. As the demand for prehospital EMS providers continues to increase, coupled with decreases in funding and limited clinical opportunities where they are involved in the treatment of actual patients, educational programs will struggle to accommodate increased enrollment while meeting education standards (Chiniara et al., 2013; McLaughlin, Starobin, & Laana, 2010). As one mechanism for bridging the gap between student enrollment and clinical opportunities, the use of educational technologies has become commonplace in healthcare education, particularly patient simulation utilizing high-fidelity mannequins (Chiniara et al., 2013; Greenblat, 2001). Educational technologies can provide students opportunities to learn applicable content in meaningful ways, with iterative feedback, in a safe and controlled environment. Additionally, integration of technology has been shown to increase student engagement and motivation in numerous settings (Hess & Gunter, 2013).

Although copious research exists in higher education related to online learning, simulation, gamification, and other related ‘high-tech’ methodologies, this line of research is just emerging in EMS education programs (Akl et al., 2013; Chiniara et al., 2013; Greenblat, 2001; Hess & Gunter, 2013; Kopp & Hanson, 2012). There is a need for course designers, educators, and researchers to investigate the use of innovative tools and learning environments to prepare future prehospital EMS providers. One such innovative technology is videos of authentic patient encounters recorded in clinical settings (VAPE).

Videos can provide students opportunities to engage in case studies for a variety of patient conditions and acuity levels that otherwise may not be available during their clinical rotations (Johnson et al., 2019). The goal of this dissertation is to identify factors influencing the intention to use, as well as the behavioral use of VAPE by EMS educational program faculty and staff. Examining factors that influence technology acceptance can increase understanding of adoption and utilization practices in EMS education.

Background of the Study

Technology Acceptance Model

The technology acceptance model (TAM) proposed by Davis (1989) explains and predicts the acceptance and utilization of technology, based on perceived usefulness (PU) and perceived ease of use (PEOU) constructs (Park, 2009; Sullivan, 2012). The extended technology acceptance model (TAM2) model, a variation on the original TAM, added constructs involving social influence (social norms and voluntariness) and instrumental processes (job relevance, output quality, and result demonstrability). The TAM and TAM2, along with other variations, have been frequently studied and are reliable models of technology acceptance (Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). Prior studies focus on adoption by large organizations, the return on investment provided, and/or user satisfaction with a given technology (Sullivan, 2012). These models are often used in higher education to analyze learning management systems, such as Blackboard and Moodle. There is a lack of technology adoption research that examines authentic synchronous video, personality, or that focuses on faculty/staff intentions. This study utilized a modified and extended technology adoption model, derived from previously developed and tested models, analyzing the likelihood additional constructs impact the intention to use a library of VAPE by EMS education program faculty/staff.

EMS Education

The prehospital provider scope of practice has greatly expanded since the conception of modern EMS. Subsequently, the corresponding education curriculum has evolved and become increasingly complex (National Highway Traffic Safety Administration [NHTSA], 2004; NHTSA, 2009a; NHTSA, 2009b; NHTSA, 2009c; NHTSA, 2019). Resultingly, EMS educators are mandated to provide students ample opportunities to interact with a variety of patient types and acuities, ensuring a minimum level of competency (Committee on Accreditation of EMS Programs [CoAEMSP], 2019). Increased curriculum requirements, decreasing clinical opportunities for live patient encounters, and limited funding have led EMS education programs to adopt an array of educational technologies. Simulation has become a benchmark for paramedic programs, many of which gauge educational quality upon the use and fidelity of simulation (Johnston et al., 2013; Kopp & Hanson, 2012). Extensive research is available on the use of educational simulation and patient outcomes, student competency, and student motivation and engagement (Akl et al., 2013; Chiniara et al., 2013; Johnston et al., 2013; Kron, F., Gjerde, C., Sen, A., & Fetters, M., 2010; Kopp & Hanson, 2012). Despite the considerable amounts of research available on simulation and healthcare education, there is a paucity of research on the use of other educational technologies such as video case-based learning for paramedic education. Centered on the same concept of pedagogical supplementation, video case-based learning can provide similar opportunities as traditional simulation (Hassoulas et.al., 2017; Ikegami et. al., 2017;

Johnson et. al, 2019; Nagy, 2018). There remains a need for course designers, educators, and researchers to investigate the use of innovative tools and learning environments to prepare future prehospital providers. This study provided insight on factors affecting the intention to use and behavioral use of video cases by faculty/staff for EMS education.

Purpose of the Study

The purpose of this study was to examine the intention and behavioral use of VAPE for prehospital provider education by EMS education program faculty and staff.

A variety of models have been used to examine a multitude of factors impacting adoption and usage. These consist of several predictive behavior models that current literature asserts will continue to be effective in predicting acceptance and usage (Park, 2009; Sullivan, 2012). Despite empirical evidence for distinct constructs such as attitude, technological competency, prior experience, and social norm, few studies have investigated these multiple affective constructs within the same model. Previous studies have either included constructs separately as correlated predictors or summed the constructs to produce a general factor (Johnson et al., 2019; Nagy, 2018; Park, 2009; Rhodes, R. & Courneya, K., 2003; Sullivan, 2012; Willis, 2008).

Research Questions and Hypotheses

The basic TAM model included and tested two specific constructs: PU and PEOU. The TAM, while widely accepted as a valid model, presented a narrow view of constructs impacting adoption and use. This original model was expanded upon to incorporate additional constructs. The TAM2 provided additional details as to why users found a given technology to be useful including: social norms and experience. TAM3 included constructs affecting PEOU such as technological competency (Lai, 2017; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). This study utilized an extended version of the TAM and includes PU, PEOU, prior experience, technological competency, social norms, and personality characteristic constructs. The study aimed to explore the factors which influence the intention to use and behavioral use of VAPE by EMS education program faculty and staff.

Perceived Usefulness (PU)

The extent to which an individual believes use of a given technology will improve their performance/aide in task completion is considered PU. PU is a traditional TAM construct shown to directly affect intent to use, behavioral usage, and satisfaction of/with a given technology (Johnson et al., 2019; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). In the context of this study, it can refer to the possibility the use of VAPE in prehospital education improves student learning. If educators believe a tool has desirable attributes that can improve student performance, they tend to develop a favorable attitude towards using it.

Hypothesis 1

Do the attitudes of EMS education program faculty/staff regarding PU impact intention to use VAPE?
$H1_0$: The PU of VAPE will not be associated with an increased intent to use.
$H1_1$: The PU of VAPE will be associated with an increased intent to use.

Perceived Ease of Use (PEOU)

PEOU refers to an individual's perception of the degree of difficulty utilizing a given technology. PEOU has been shown to have a direct effect on PU, intent to use, behavioral usage, and user satisfaction (Johnson et al., 2019; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). PEOU is associated with the 'user-friendliness' of the tool and has been shown to be an antecedent of technology adoption.

Hypothesis 2

Do the attitudes of EMS education program faculty/staff regarding PEOU impact intention to use VAPE?
$H2_0$: The PEOU of VAPE will not be associated with an increased intent to use.
$H2_1$: The PEOU of VAPE will be associated with an increased intent to use.

Social Norms

Social norms are formed from industry standards, colleague, and supervisory influence. They can be defined as an individual's judgement of peer opinions regarding what "should" or "should not" be done, or the influence of others. Previous research shows significant correlations between subjective social norms and intent to use technology (Nagy, 2018; Willis, 2008).

Hypothesis 3

Do social norms impact the intention to use VAPE by EMS education program faculty/staff?
$H3_0$: The perception of social pressure to use/not use VAPE will not be associated with an increased intent to use.
$H3_1$: The perception of social pressure to use/not use VAPE will be associated with an increased intent to use.

Personality Characteristics

Little research exists and current TAM models lack detail regarding the impact of personality characteristics on intent to use. A study by Sullivan (2012) determined a positive relationship between extraversion and openness and the acceptance of technical knowledge management systems. This study sought to determine if there is a relationship between the personality characteristics of EMS educators and their intent to use and behavioral use of VAPE.

Hypothesis 4

Does personality characteristics impact intention to use VAPE by EMS education program faculty/staff?
$H4_0$: The users personality characteristics will not impact their intention to use.
$H4_1$: The users personality characteristics will impact their intention to use.

Technological Competency

Technological competency denotes a user's ability to utilize a given technology. It includes relevant skills and knowledge required to implement technology in the creation and application of learning items. Insufficient technological competency is inhibitory to adoption of new technologies (Johnson et al., 2019; Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Willis, 2008). This study sought to determine if there is a relationship between EMS educator technological competence and the intention to use VAPE.

Hypothesis 5

Does technological competency (self-efficacy) impact the likelihood of intention to use VAPE by EMS education program faculty/staff?
$H5_0$: The users' technological competency will not impact their intent to use.
$H5_1$: The users' technological competency will impact their intent to use.

Prior Experience

This study introduced the prior experience of EMS education program faculty/staff as a moderator that may affect the intention to use and behavioral use of VAPE. Prior experience encompasses their individual personal education, experience as an educator, and clinical practice.

Hypothesis 6

Does the prior experience of EMS education program faculty/staff impact the likelihood of intention to use VAPE?
$H6_0$: The prior experience of faculty/staff will not impact their intention to use.
$H6_1$: The prior experience of faculty/staff will impact their intent to use.

Significance of the Study

The opportunity for students to apply the knowledge gained from classroom, laboratory, and personal study to authentic patient interactions is invaluable. However, numerous factors impact the frequency of interactions, numbers and types of patients, and treatment procedures for which students have occasion to perform. Due to the intricacies of clinical education for prehospital providers, as well as the delicate nature of agreements between clinical sites and educational institutions, students often experience an insufficient number of hands-on patient interactions and treatments (Chiniara et al., 2013; Lazarou, 2011). Therefore, they are sometimes unable to fulfill certain learning objectives set by the curriculum. For these students, educators are tasked with finding suitable alternatives to direct patient contact to fill gaps in student learning. As one potential alternative to directly supervised patient care in a clinical setting, VAPE afford students the opportunity to interact with content that is directly applicable to their academic and professional endeavors (Akl et al., 2013; Greenblat, 2001; Hess & Gunter, 2013; Kopp & Hanson, 2012).

For educational program faculty/staff there are problems of coverage, relevance, and methodology in the academic process. This is where information and communication technologies, as well as the development of mobile applications, have generated changes in education and society. Despite the abundance of literature related to the utility of simulation and standardized patients in the education of allied health professionals, research on educational technologies utilized in prehospital EMS education is lacking (Hassoulas et.al., 2017; Ikegami et. al., 2017; Johnson et. al, 2019; Nagy, 2018).

Educators seek to use technologies to facilitate the learning process and create new directly applicable learning opportunities. TAM has been widely used and has been found useful for the determination of factors influencing the intention to use and adopt various technologies. Previous research used different factors, samples, and technologies to study intention to use (Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Willis, 2008). In this study, the most used factors (PU, PEOU, experience, technological competency (self-efficacy), and social norms) were compiled in one model with the addition of personality characteristics determined by the Five Factor Model (FFM) to discover the intention to use and behavioral use of VAPE. Examining factors that influence technology acceptance can increase understanding of adoption and utilization practices in EMS education.

Rationale for Methodology

The nature and context of this study make it suitable to use a quantitative strategy of analysis. It aims to test hypothesized relationships within the context of intention to use in an objective manner. The constructs and their relationships are predicted from theories and models regarding adoption and technology acceptance. A cross-sectional survey will be used to collect the data. Using a survey approach, the data can be collected from numerous participants simultaneously. Path analysis, a structural equation modeling (SEM) technique, will be used to test hypotheses and moderators performing several tests such as group comparisons which require a large sample. Therefore, using a survey data collection method is appropriate from the ontological, epistemological, and methodological point of view. Additionally, a self-administered questionnaire is easily designed and administered and provides higher anonymity/confidentiality of respondents.

The survey was administered to academic professionals currently working with or teaching for an accredited prehospital EMS education program. The survey was structured in four parts; Part I: attitude (perceived usefulness, perceived ease of use), Part II: demographics and prior experience, Part III: technological competency, Part IV: social norms and personality.

To study the intent to use VAPE among EMS education program faculty and staff, a technology acceptance model can be adopted to provide a framework for analysis. A path analysis approach pairs well to test model fit and examine correlations between variables. Path analysis is an extension of multiple regression, which identifies effects between variables in a proposed model. The model used in this study focused on examining the impact of PU, PEOU, prior experience, technological competency (self-efficacy), social norms, and personality characteristics constructs on intention to use and behavioral use of VAPE.

Assumptions of the Study

A critical assumption of previous TAM models is their constructs fully mediate the influence of external variables on usage behavior (Park, 2009; Sullivan, 2012; Willis, 2008). This study assumed the proposed unique version of TAM is an accurate reflection of intent to use and behavioral use of VAPE among EMS education program faculty and staff.

This study supposed previously developed instruments (including the FFM) incorporated from prior studies were adequately tested for validity and reliability. Based on this assumption these instruments could be utilized with a high degree of confidence. It is also assumed the sample of educators from accredited institutions were (1) representative of the entire population of EMS education program faculty and staff; (2) on some level, involved in the design or instruction of EMS curriculum; (3) had the means to respond to the electronic survey; (4) participated truthfully and with integrity, without influence or interference from others.

There are several assumptions to consider when using a SEM method to analyze data including: (1) a theoretical basis or prior experience to set or indicate an initial relationship among variables in the model under consideration; (2) a normal distribution of data; (3) well measured variables; and (4) a minimum number of cases for each variable.

Chapter 1 Summary

Advancements to EMS education necessitate the incorporation of educational technologies to ensure students meet requirements and are competent to provide care to patients. Outside of high-fidelity simulation, research surrounding these technologies in EMS education is scarce. Research on educational technologies is crucial for course designers, educators, and administrators to make informed decisions regarding the use of innovative tools in the preparation of future prehospital care providers (Chiniara et al., 2013; Greenblat, 2001; McLaughlin, Starobin, & Laana, 2010). This study provided insight on factors affecting the intention to use and behavioral use of VAPE by faculty/staff for EMS education. The TAM (and a multitude of extended TAM versions) has been employed to measure intention to use, adoption, and behavioral usage of an array of technologies (Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). This study utilized a uniquely extended version of the TAM incorporating PU, PEOU, prior experience, technological competency, social norms, and personality characteristics constructs of EMS education program faculty and staff into a single model. An online survey was deployed to collect data, from academic professionals working with or teaching for an accredited EMS education program. Results were analyzed using SPSS through a path analysis, determining the existence of correlations between model constructs and faculty/staff intention to use. Examining factors that influence technology acceptance can increase understanding of adoption and utilization practices in EMS education.

The next chapter, a review of literature, will discuss the historical background impacting this study including TAM, as well as milestones in EMS education, theory relevant to the study research questions/hypotheses, and current empirical literature relevant to research questions and hypotheses.

Chapter three details the methodology used to conduct the study. Sections within the methods chapter include participants, instruments, materials, procedure, and analysis. Chapter four presents the results of the analyses in order by research question. Finally, chapter five presents results interpreted considering the research questions and discussed in conjunction with additional literature. The final chapter includes a discussion of study limitations and recommendations for future research.

Definition of Terms

1. *Behavioral Intention*: measurement of an individual's intention to perform a certain behavior (Park, 2009; Sullivan, 2012; Willis, 2008).

2. *Computer based simulation:* a computer-based model that replicates real-world events in response to the change or modification of a given system (Karakus et al., 2014; Malone et al., 2010).

3. *High-fidelity human-patient simulators:* High-fidelity human-patient simulators are computer-operated, life-sized mannequins capable of the physiological reproduction of signs and symptoms typically encountered as part of a medical emergency. The output of the device provides realistic chest and heart sounds, pulses, and laryngeal reflexes and allows monitoring of all vital signs in a manner identical to that used in an Authentic setting (Aldrich, 2004; McCoy, E., Rahman, A., et al., 2019; McKenna et al., 2015; McLaughlin et al., 2010).

4. *Low-fidelity simulators:* simulators that are static, with few features, and little realism. Low fidelity simulation would typically be used for demonstration and practice of specific psychomotor skills (Aldrich, 2004; McCoy, E., Rahman et al., 2019; McKenna et al., 2015; McLaughlin et al., 2010).

5. *Mid-fidelity simulators:* Slightly more realistic than low fidelity and can be used in a broader understanding of more complex skills (such as the identification of heart, lung, and bowel sounds) (Aldrich, 2004; McCoy, E., Rahman, A., et al., 2019; McKenna et al., 2015; McLaughlin et al., 2010).

6. *Predictive behavior models:* research models used to predict and understand the beliefs, attitudes, and intentions towards technology adoption, usage, or aversion.

7. *Perceived Ease of Use (PEOU):* An individual's discernment of the degree of difficulty in utilizing a given technology (Nagy, 2018; Park, 2009; Willis, 2008).

8. *Perceived Usefulness (PU):* An individual's discernment of how a given technology will help them to accomplish specific tasks and improve job performance (Nagy, 2018; Park, 2009; Willis, 2008).

9. *Scenario:* A scenario is a description of a person's interaction with a system or event. For prehospital providers, scenarios are narratives or outlines of the emergency event, the providers' interaction with the patient(s), and the providers' findings (Chiniara et al., 2013; Sanders & McKenna, 2019).

10. *Self-efficacy*: belief in his/her capabilities to organize and carry out activities to achieve a desired effect (Nagy, 2018; Park, 2009).

11. *Simulation:* "A methodology for understanding the interrelationships among components of a system or process. Simulations differ from games in that they test or use a model that depicts or mirrors some aspect of reality in form, if not necessarily in content. Learning occurs by studying the effects of change on one or more factors of the model (Aldrich, 2004)."

12. *Standardized patient:* A standardized patient is someone who has been trained to portray, in a convincing manner, a patient in a medical situation (Aldrich, 2004; McCoy, E., Rahman, A., et al., 2019; McKenna et al., 2015; McLaughlin et al., 2010).

13. *Subjective social norms:* perceived opinions that compel individuals to exhibit specific behaviors, the influence of other people. These are usually formed from colleague and supervisory influence. Individual judgement of peer opinions regarding what "should"

or "should not" be done, a measure of workplace norms (Park, 2009; Sullivan, 2012; Willis, 2008).

14. *Task trainer:* task trainers allow the practice of an isolated psychomotor skill. These simulators do no incorporate feedback, such as verbal cues or physiological changes (Aldrich, 2004; McCoy, E., Rahman, A., et al., 2019; McKenna et al., 2015; McLaughlin et al., 2010).

15. *Technology acceptance model* (*TAM):* The technology acceptance model predicts the likelihood of acceptance and utilization of new technology. It is an adaptation of the Theory of Reasoned Action which postulates beliefs influence intentions and behaviors. TAM theorizes an individual's perception of the utility of a given technology impacts their intent to use it (Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008).

16. *The Big-Five model*: A comprehensive framework of personality. The Big-Five is a widely replicated and validated methodology for understanding, explaining, and measuring personality (Barak, 2011; Johnson, 2017; Lai, 2017; Smith et al., 2019).

17: *Theory of Planned Behavior (TPB):* a predictive behavior model that is used to identify the factors affecting a person's intentions to perform/not perform a task. The theory of planned behavior expands upon the theory of reasoned action by including an additional construct; perceived behavior control (Ajzen, 1991; Ajzen, 2005).

18. *Theory of Reasoned Action (TRA):* a predictive behavior model that is used to identify the factors affecting a person's intentions to perform/not perform a task. The theory of reasoned action shows an individual's attitude, and their subjective norms are the best prediction of the individual's actual behavior (Ajzen, 2005; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975).

19. *Unified theory of acceptance and use of technology (UTAUT):* Predictive user adoption model of information technology. The UTAUT integrates eight existing theories including TAM, TRA, and the TPB (Lai, 2017; Venkatesh & Davis, 2000; Venkatesh et al., 2003).

20. *Virtual Reality simulator:* an educational tool using a virtual reality interface that brings together a 2D or 3D model of a real apparatus and a virtual visualization of a physical situation interactively (Kim et al., 2001; McKenna et al., 2015).

CHAPTER TWO: LITERATURE REVIEW

Introduction to Chapter Two: Literature Review

Background of the Problem

Society puts their trust and wellbeing into the hands of healthcare providers every day. We accept that if an individual is working within the healthcare system they have been certified or licensed by an appropriate regulatory body, are current on trends and changes through continuing education, and are competent in both their knowledge and skills. Physicians, nurses, therapists, radiologists, and almost every member of the healthcare team perform complicated procedures daily. It is taken for granted that at some point during the education and training process, these providers were evaluated to make sure that they could think critically and perform procedures with a certain level of skill and competence. The measurement of competency is an exceedingly critical part of health care training and education and one that in the field of prehospital medicine has been increasingly studied (Edwards, 2011; Von Vopelius-Feldt & Benger, 2013).Without adequate and accurate measure of cognitive, affective, and psychomotor skills, society cannot be assured that individuals who are working as providers are proficient and safe to practice within their fields.

The nature of prehospital EMS education requires a portion of learning to occur outside the traditional classroom, in settings such as hospital intensive care units, emergency departments, and EMS agencies. Administrative and regulatory bodies outline curriculum standards around learning objectives set forth by the Department of

Transportation's National Standard Curriculum (CoAEMSP, 2019; NHTSA, 2009a; NHTSA, 2009b). Additional Paramedic educational program requirements are promulgated by state Emergency Medical Services regulatory bodies such as the North Carolina Office of Emergency Medical Services (NCOEMS) (North Carolina Office of Emergency Medical Services [NCOEMS], 2020). In addition, the Committee on Accreditation of Educational programs for the Emergency Medical Services Professions (CoAEMSP) offers an extension to state mandated educational guidelines for programs that wish to be accredited (CoAEMSP, 2019).

Most educational programs require a specified list of patient type and acuity levels (e.g., 50 adult patient assessments, 25 pediatric assessments, 10 obstetric assessments, 50 advanced life support, 25 basic life support, etc.), patient complaints (e.g., 20 chest pain patients, 10 adult respiratory distress, 40 traumatic injuries, etc.), and skill performances in which students must participate (e.g., injections, medication administration, cardiopulmonary resuscitation, airway control, etc.) (CoAEMSP, 2019; NHTSA, 2009a; NHTSA, 2009b). While most of the mandated types of patient encounters are common and frequently faced by students, others are rare occurrences. Additionally, due to competition among schools for available clinical space as well as the delicate nature of agreements between clinical sites and educational institutions, students often experience an insufficient number of hands-on patient interactions and skill opportunities (Chiniara et al., 2013; Lazarou, 2011). Consequently, students may not be able to fulfill certain learning objectives proposed by the curriculum (CoAEMSP, 2019; NCOEMS, 2020; NHTSA, 2009a; NHTSA, 2009b). To further complicate the issue, enrollment in healthcare educational programs has been increasing, healthcare facilities patient census counts have diminished due to factors such as shorter stays and fewer admissions, and strict limitations on the types of patients and procedures students can observe and perform have been imposed by some clinical agencies (Johnston et al., 2013; Katz et al., 2013). Subsequently, students are exposed to fewer patients, which equates to scarcer learning opportunities. When students can interact in actual patient care situations, the situations often involve high acuity patients. This can be stressful, particularly for students who may not feel confident. Student-provided care may also pose a risk to patients, and clinical site administration is regularly unwilling to assume such risks (Huber et al., 2012; Johnston et al., 2013; Katz et al., 2013; Kopp & Hanson, 2012).

History of EMS Education

In September of 1966 the Committee on Trauma and the Committee on Shock, Division of Medical Sciences, National Academy of Sciences, National Research Council, published a document that changed Emergency Medical Services (EMS). The document was titled "Accidental Death and Disability: The Neglected Disease of Modern Society", also known as "The White Paper". "The White Paper" facilitated the establishment of emergency services through identifying accidents as an 'epidemic' requiring national attention (Brooks et al., 2016; Ferbarache, 2016; National Academy of Sciences, 1966).

Following release of the "White Paper", The National Highways and Safety Act of 1966 was enacted by Congress. This act placed the Department of Transportation (DOT) in charge of state programs that could reduce traffic accidents and the injuries and deaths associated with them. The "home" of EMS has always been the U.S. Department of Transportation as a result of the unforeseen consequences of funding early program development (Brooks et al., 2016; NHTSA, 2017; Sanders & McKenna, 2019).

In 1996 the National Highway Traffic Safety Administration (NHTSA) published "Emergency Medical Services Agenda for the Future." followed by the "Emergency Medical Services Agenda for the Future Implementation Guide" in 1998. These documents laid out a series of recommendations, objectives, and suggestions to achieve a national and consistent vision of EMS in the United States (Brooks et al., 2016; NHTSA, 2017; NHTSA, 1996; Sanders & McKenna, 2019). In 2000, NHTSA published "Emergency Medical Services Education Agenda for the Future: A Systems Approach (Education Agenda)." It laid out a structure of five components: 1) National EMS Core Content 2) National EMS Scope of Practice Model 3) National EMS Education standards 4) National EMS Certification 5) National EMS Program Accreditation. The National EMS Core Content was published in May 2005, the National EMS Scope of Practice Model in 2006, and the National EMS Education Standards in 2009. The final two components of national certification and program accreditation, more than 20 years later, are still forthcoming (Brooks et al., 2016; NHTSA, 2017; NHTSA, 2000; Sanders & McKenna, 2019).

Current State of EMS Education

The scope of practice for Emergency Medical Technicians and Paramedics have expanded significantly in the last two decades and encompass skills such as administration of continuous positive airway pressure (CPAP), rapid sequence induction (RSI), surgical cricothyrotomy, and ultrasound examination. Prehospital certifications have evolved and include three levels of credentials, each with a diverse set of proficiencies: Emergency Medical Technician (EMT), Advanced Emergency Medical Technician (AEMT), and Paramedic. The initial level is the EMT who can perform cardiopulmonary resuscitation, patient assessment, delivery of a newborn, splinting, and hemorrhage control procedures. The AEMT can perform all functions of an EMT plus administer a narrow set of medications and perform minimally invasive procedures, such as intravenous catheterization and endotracheal intubation. Paramedic is the most advanced credential level and includes the skill set, an expanded medication formulary, as well as advanced invasive procedures such as surgical airways. The National EMS Scope of Practice model, updated in 2019, describe each accepted scope of practice expectations for the varying levels of EMS providers (Brooks et al., 2016; Brown et al., 1996; NHTSA; 2019).

Despite advances in provider care and technology, minute changes have occurred in the pedagogical/andragogical delivery of EMS curricula over the last three decades (Brooks et al., 2016; Ruple et al., 2005; Ruple et al., 2006). The state of EMS education research project (2005) randomly selected a group of experienced educators to quantify characteristics of EMS educators, the infrastructure available to them, and the common practices they value. Currently, half of EMS educators are utilizing federally generated curricular content materials over creating their own learning items, and more than 20% are uncomfortable in assessing student performance in the psychomotor domain (Brooks et al., 2016; Ruple et al., 2005; Ruple et al., 2006). Regardless of the availability of high-fidelity simulation equipment, EMS education program faculty report receiving minimal training, with 19% of faculty reporting that they received no mannequin simulator training, the majority of which is supplied by manufacturers. Concomitantly, less than half of EMS education programs report availability of simulation support personnel (McKenna et. al., 2015). This demonstrates a deficiency in competency as it relates to educational theory and application. Active EMS educators are utilizing pedagogical methods that are considered antiquated, are uncomfortable assessing student competency, have a lack of training in simulation education, and fail to teach application of content to practical situations. More than twenty years following the EMS Education Agenda for the Future: A Systems Approach, EMS education has remained stagnant (Brooks et al., 2016; CoAEMSP, 2019; NHTSA, 2000; Ruple et al., 2005; Ruple et al., 2006; Sanders & McKenna, 2019; McKenna et. al., 2015).

Educational Technology in EMS Education

Paramedic education programs encounter difficulty ensuring exposure to and assessment of the required variety of patients and conditions. As a result, paramedic education has turned to simulation (Chiniara et al. 2013; Cicero et al., 2017; Huber et al., 2012, Johnston et al., 2013; Katz et al., 2013; Kopp and Hanson, 2012; McCoy, E. Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004). Simulation has become a benchmark for paramedic programs, many of which gauge educational quality upon the use and fidelity of simulation (Kopp and Hanson, 2012; Johnston et al., 2013; McCoy, E. Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004). Extensive research is available on the use of educational simulation and patient outcomes, student motivation and engagement, and student competency (Akl et al., 2013; Chiniara et al., 2013; Cicero et al., 2017; Huber et al., 2012; Johnston et al., 2013; Katz et al., 2013; Kopp and Hanson, 2012; Kron et al., 2010; Lee & Byun, 2014; Lee et al., 2012; Leveritt et al., 2013; McCoy, E., Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004; Rondon et al., 2013; Yang, 2012).

Simulation provides students opportunities to practice complex scenarios, using cognitive knowledge and psychomotor skills, that may be unavailable to them in either the clinical or classroom setting. Over time simulation exposure can lead to increased student competency (Chiniara et al., 2013; McCoy, E., Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004). Simulations are designed to replicate multiple aspects of a live environment and provide the student an opportunity to perform without the fear of causing negative patient outcomes. Simulations change as students interact with the environment and provide immediate feedback on student decision making (Chiniara et al., 2013; Cicero et al., 2017; Kopp & Hanson, 2012; McCoy, E., Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004). Learning outcomes can be plentiful and address not only cognitive content, but psychomotor and affective domains. The intent of simulation training in paramedic education is to supplement the emergent gap between clinical education and traditional cognitive classroom teaching methods (Chiniara et al., 2013; Cicero et al., 2017; Kopp & Hanson, 2012; McCoy, E., Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004).

Most EMS education programs report adequate access to a variety of simulators including task trainers, low-fidelity simulators, high-fidelity simulators, and simulated patients. A select few programs even report access to computer-based simulation and virtual reality (McKenna et al., 2015). Although copious research exists in higher education, aeronautics, neurology, and nursing related to simulation, online learning, gamification, and other related '*high tech'* methodologies, in EMS education programs such study is just emerging. Despite adequate access to diverse simulation and *'high tech'* tools in EMS education programs, they are not used on a consistent basis; nearly a third of programs report equipment sitting idle and unused. EMS education programs rarely and sporadically use live simulated patients (66%), computer-based simulation (games and scenarios) (31%), and virtual reality (4%) when appropriate (McKenna et al., 2015).

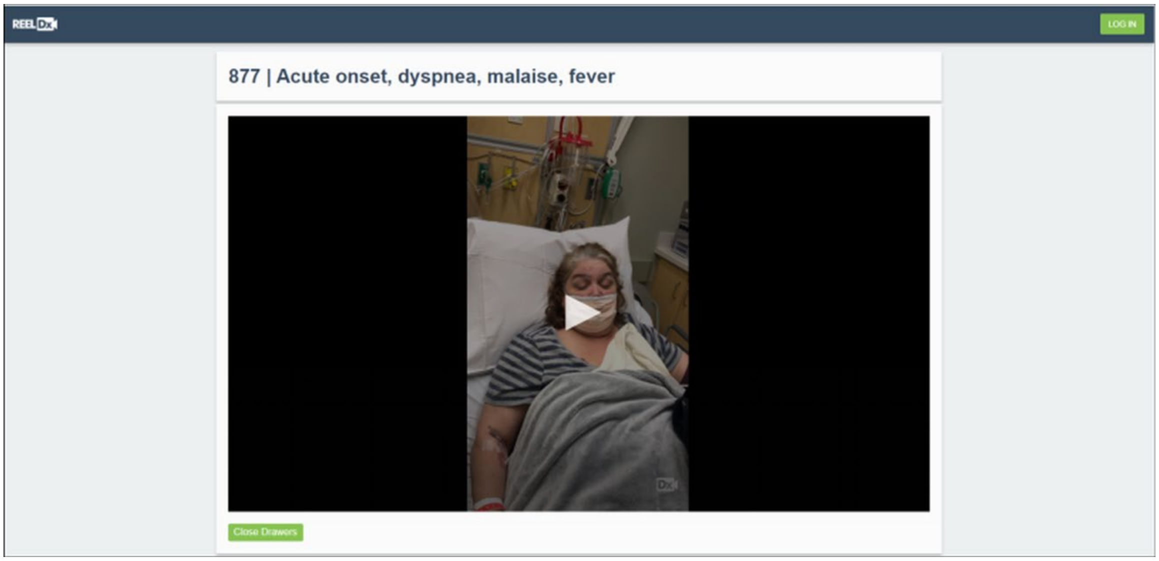
The paucity of literature within the context of educational technologies and prehospital EMS education indicates it has not been utilized or a lack of investigation/publication exists to show its use and efficacy. Therefore, a need remains for course designers, educators, and researchers to investigate the use of innovative tools and learning environments to prepare future prehospital providers (Akl et al., 2013; Chiniara et al., 2013; Cicero et al., 2017; Huber et al., 2012; Johnston et al., 2013; Johnson et al., 2019; Katz et al., 2013; Kopp & Hanson, 2012; Kron et al., 2010; McCoy, E., Alrabah, R., et al., 2019; McCoy, E., Rahman, A., et al., 2019; Riley et al., 2004). Previous EMS education research reports few details on design guidelines, implementation, acceptance, and effectiveness of video usage.

A variety of educational technologies can provide students a low stress environment where they can make judgments regarding patient care without concern of injury to the patient or failure to perform on their part. This allows for student conceptualization and reflection on the learning process, an increase in student confidence and motivation, and an increase in clinical performance. Educational technologies such as scenarios and video case-based learning can increase student interactions across varied patient age groups, complaints, and impressions (Smith et al., 2019).

Authentic patient video cases afford students the opportunity to interact with content and environments that are directly applicable to their academic and professional endeavors, creating a means to obtain experience. Videos can provide opportunities to learners to engage in case studies related to a variety of patient conditions and acuity levels. These experiences can include patient assessments, critical thinking and problem solving, and the opportunity to test their competence in a leading role (Johnston et al., 2013; Katz et al., 2013). Video based training programs can be an effective way of presenting information as a means of initial and continuing education, impacting the way prehospital providers evaluate and treat patients in the future (Seamon et al., 1997).

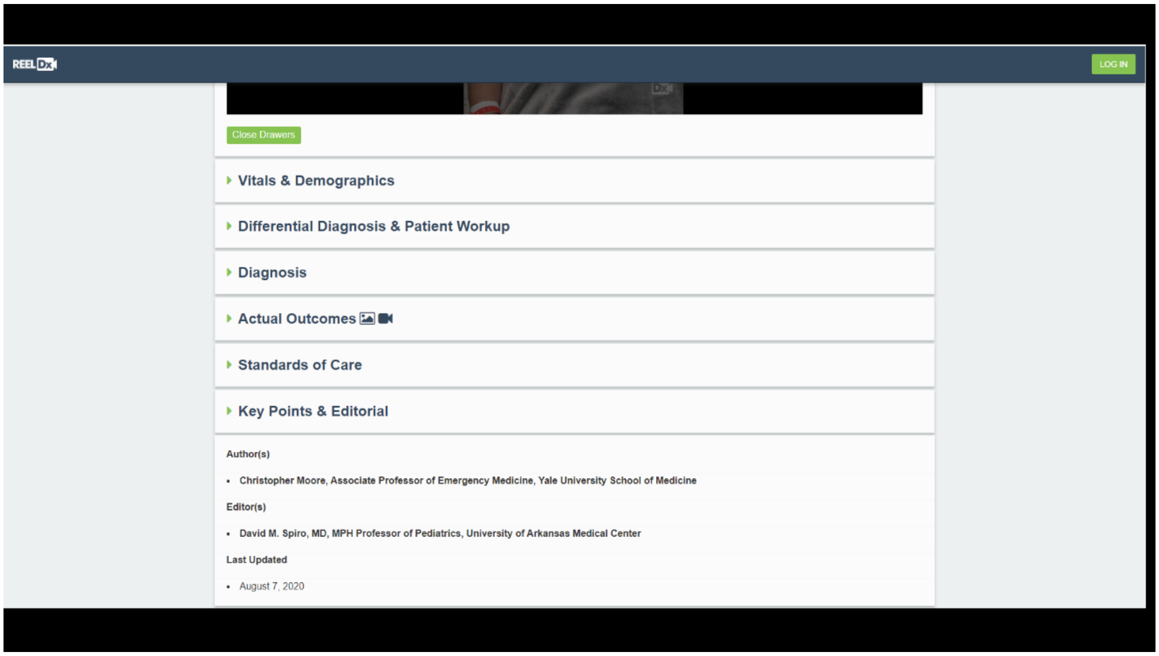
ReelDx

ReelDx is an online application and the sole provider of a substantial and growing online library of patient video case studies. These videos are captured during actual patient encounters, live, and in real time. The online library is expansive, with over one-thousand available cases. All videos are compliant with the Health Insurance Portability and Accountability Act (HIPAA)and feature actual patients captured by medical professionals during actual events occurring in the Emergency Department, physician exam rooms, community clinics, and prehospital settings. Additionally, videos are peer reviewed by subject matter experts and editorial comments are available to guide teaching and promote critical thinking. Videos are reviewed by medical content experts and display critical elements of assessment, diagnosis, and/or treatment (ReelDx, 2020).



Picture 1. Case 877 taken from ReelDX

Case details are presented in a logical sequence and follow a consistent format. Case details include patient demographics, patient complaint, vital signs, past medical history, history of the present illness, suggested differential diagnosis, patient workup, final diagnosis, treatment, and disposition post diagnosis. Case details are placed in 'drawers,' access to which is controlled by educators. Links to suggested resources for further research and notes from the case contributors/editorial team are also available. ReelDx is unique in its approach to teaching by allowing educators to assign cases to students, control which case details are visible, and monitor student interaction with case materials (ReelDx, 2020).



Picture 2. Case drawers taken from ReelDX

Case Based Education

Transitioning from novice to competent to expert is challenging and remains problematic for student and instructor. Complicating this transition further are a rapidly changing medical curriculum and mandated clinical performances; presenting prehospital programs diverse challenges (Albanese, 2005; Keppel et al., 2001). Opportunities to increase authenticity are often limited in traditional settings due to pedagogical, ethical, and logistic restraints on the interactions with actual or simulated patients. Shifting the focus from a traditional method of instruction to one that incorporates problem or case-based learning may prove effective. Case-based approaches encourage students to construct their knowledge, in collaboration or individually, and take responsibility for their learning.

In contrast to traditional lecture-based approaches, case-based learning highlights educational sessions where students learn by solving problems derived from real practice. In medical education these problems are realistic patient cases (Albanese, 2005; Keppell et al., 2001; Leng et al., 2007). Patient cases integrate different aspects of a problem, including behavioral and psychosocial factors, treatment, and prevention. The case-based 'scenario' should be designed to allow students to explore an aligned set of learning outcomes, furthering their knowledge and critical thinking abilities (Leng et al., 2007).

Case-based learning is closely related to problem-based learning. The difference between problem-based learning (PBL) and case-based learning (CBL) is that PBL requires no prior experience or content knowledge. In comparison CBL requires some degree of prior knowledge which is utilized in solving the problem (Williams, 2005). Cases place events in context to a situation that promotes authentic learning. Cases are intended to foster learning for competence and offer a multitude of benefits including learner hypothesis generation, self-evaluation and reflection, development of a team-based approach, development of intrinsic and extrinsic motivation, scientific inquiry and the development of supporting arguments, and the integration of knowledge and practice (Albanese, 2005; Keppell et al., 2001; Leng et al., 2007; Williams, 2005).

Studies report students prefer CBL and reporting it as enjoyable and feeling better prepared to ask questions, more motivated to participate in group and collaborative activities, improved capability in diagnostic interpretation and logical thinking, and increased proficiency for dissecting materials (Williams, 2005). Video cases provide a useful way to present case-based learning and enhance the authenticity of patient cases (Albanese, 2005).

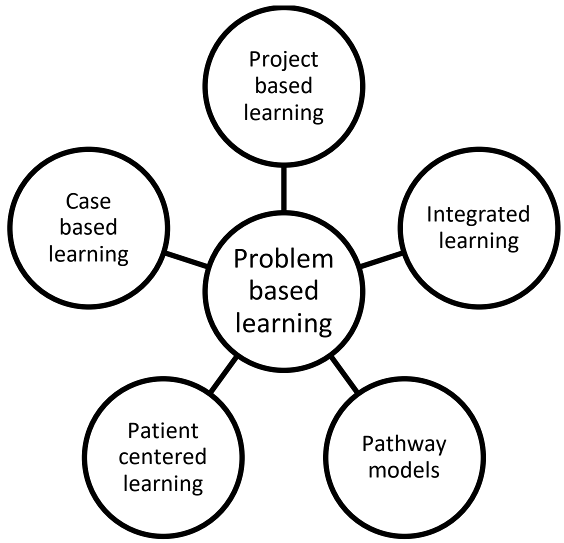


Figure 1. Diagram of problem-based learning (Williams, 2005).

Video Based Education

Use of both video and film have an extensive history in education. For example, both mediums were used during World War II as training instruments for soldiers (Hovland, Lumsdaine, & Sheffield, 1949). Educators have acknowledged the effects of audio-visual materials on the attention and motivation of learners, as well as the overall learning experience for years. The use of educational video in classrooms and distance education, has amplified over the last three decades (Albanese, 2005; Ikegami et al., 2017; Johnson et al., 2019; Kron et al., 2010; Leng et al., 2007). Educational video is not only widely used but is valued as effective and creative. There is an evident relationship between frequency of use and perceived achievement and motivation. When educational video is used, the number of students who report increases in learning and engagement multiply (Ikegami et al., 2017; Johnson et al., 2019; Kron et al., 2010; Marshall, 2002; Nagy, 2018). Educational video has been found to reinforce reading and lecture, promote a common knowledge across a cohort of students, enhance comprehension and discussion, accommodate learning preferences, and increase motivation (Albanese, 2005;

Cicero et al., 2017; Ikegami et al., 2017; Johnson et al., 2019; Kron et al., 2010; Leng et al., 2007; Marshall, 2002; Nagy, 2018).

Educational video is no longer considered a passive activity, a frivolous waste of time impeding academic progress and achievement. Research reinforces viewing as an active engaged process where individuals are connected to the content, experiencing a process of monitoring, receiving, processing, questioning, and comprehending. Viewing is deemed to be a cognitive activity that develops and matures to promote learning (Ikegami et al., 2017; Johnston et al., 2013; Johnston et al., 2019; Leng et al., 2007; Marshall, 2002). Both content and context of educational videos are crucial. Content should be skill appropriate. The content is a more veritable determinant of academic success than time spent viewing, much like the impact of appropriate and aligned content of traditional lectures on student learning outcomes (Ikegami et al., 2017; Johnston et al., 2019; Kron et al., 2010; Marshall, 2002; Nagy, 2018).

When the concepts of educational videos and case-based learning are combined there are numerous advantages to learners. Students, not the experts, complete translations of images and sounds connected to a patient presentation and relate it to a medical diagnosis, treatment, and plan. They build pattern recognition skills instead of learning to diagnose based on verbal labels. They observe events and gain their own individual perspective, instead of through that of another provider. Students can observe therapeutic communication skills, standard examination techniques, and a provider-patient relationship (Hassoulas et al., 2017; Ikegami et al., 2017; Johnson et al., 2019; Keppell et al., 2001; Marshall, 2002; Thomas, 2001). Video case-based learning helps students to create realistic mental pictures of pathophysiology and to apply this to a person, they provide a high resemblance of life but are still open to ambiguity and can assist in connecting mental representations to the real world in a way text fails (Hassoulas et al., 2017; Ikegami et al., 2017; Johnson et al., 2019; Marshall, 2002; Nagy, 2018).

Technology Adoption Models and Theories

Predictive Behavior Models

Predictive behavior models are used by researchers to understand the affective domain including beliefs, attitudes, and intentions to adopt and utilize a given tool. There are three conventional models employed in the research of technology adoption including the theory of reasoned action, the theory of planned behavior, and the technology acceptance model (Ajzen, 2005; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Davis, 1989).

Theory of Reasoned Action

The technology acceptance model (TAM) was derived from the theory of reasoned action (TRA) and the theory of planned behavior (TPB) (Ajzen, 2005; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Davis, 1989). Fishbein and Ajzen's (1975) theory of reasoned action is based on the conjecture of an individual's ability to systematically process information, with the goal of predicting and understanding their resulting behavior. According to the theory of reasoned action, intentions to perform a behavior immediately precede the behavior (Fishbein & Ajzen, 1975). Hence, it is important to identify the determinants of an individual's intention. TRA predicts behavioral intentions are best predicted by two correlated factors: an individual's attitudes and subjective norms (Ajzen, 2005; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Each factor is further comprised of other elements. Attitude includes the attitude towards the behavior and outcome evaluation. Attitude towards a behavior denotes an individual's judgement of behavior performance as appropriate or inappropriate. Attitude towards a behavior can also be determined by beliefs about that action, which are formed through life experiences. Outcome evaluation is the interpretation of an individual that a behavior will result in a favorable or unfavorable set of consequences. While subjective norms include normative beliefs (what an individual assumes others would want or expect of them) and motivation to comply (how important it is to the individual to do what others expect). According to the theory of reasoned action, the more a person perceives others desire the performance of a behavior the more likely they are to engage in that behavior. Largely, this theory suggests intentions of an individual to perform/adopt or not perform/adopt a behavior/tool is founded by their attitude and their subjective norms.

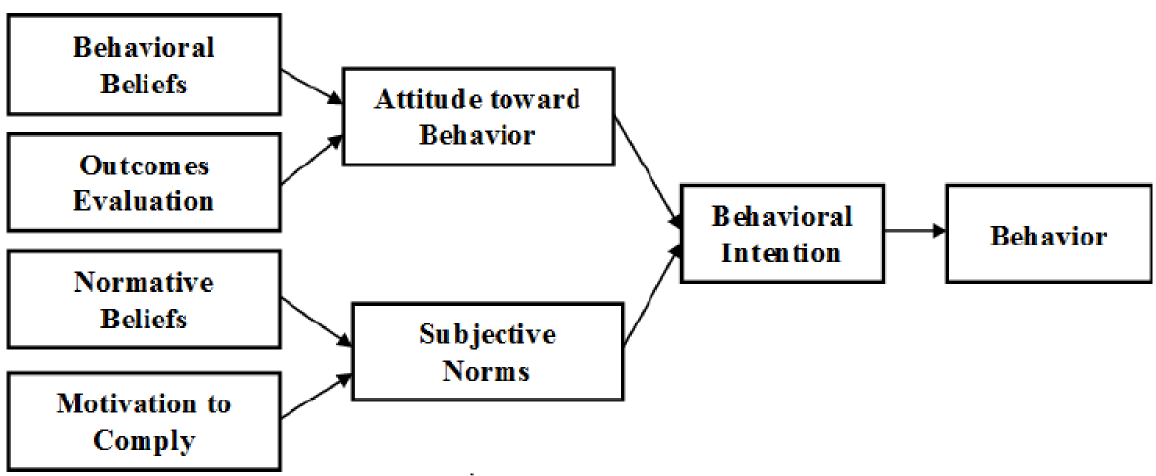


Figure 2. The Theory of Reasoned Action—TRA (Fishbein & Ajzen, 1975).

Theory of Planned Behavior

The theory of planned behavior expands upon the theory of reasoned action. It includes the original factors of attitude and subjective norms examined by Fishbein and

Ajzen (1975 & 1980) and adds perceived behavior control. Perceived behavior control was conceived by Ajzen (1991) to control for involuntary behaviors included in the TRA. As a result of this addition, intention to perform a behavior is influenced by individual attitude, subjective norms, and perceived behavior control.

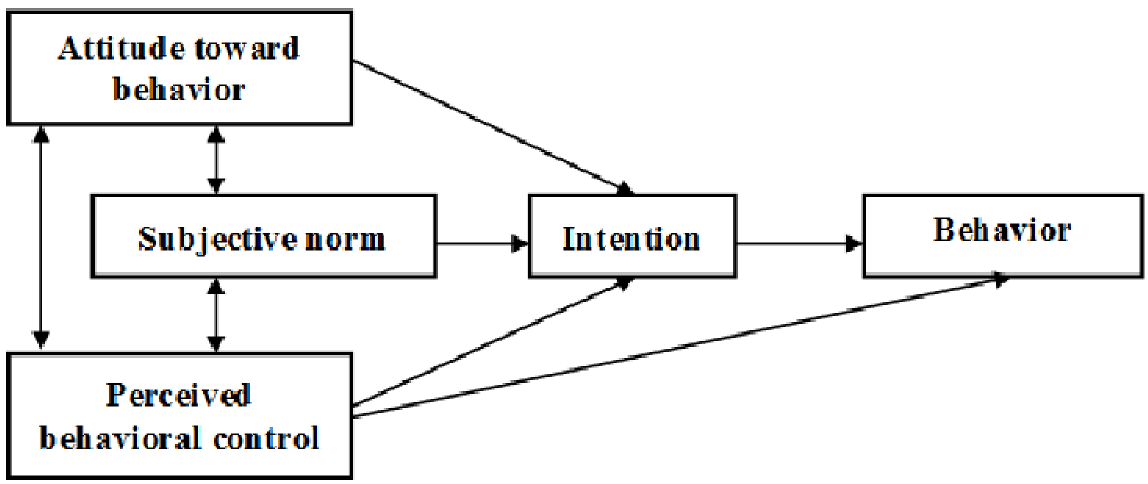


Figure 3. Theory of Planned Behavior—TPB (Ajzen, 1991).

The Technology Acceptance Model

The most widely used model to explain adoption and utilization of technology is the Technology Acceptance Model (TAM) (Lai, 2017; Nagy, 2018). Davis (1986) proposed the TAM in 1986 as a technique to explain and predict user behavior of information technology. It is a variation of, the TRA, which postulate beliefs influence intentions and subsequently user behaviors. TAM differs from previous theories by accounting for the required adoption of a technology within an institution/organization. It outlines how external variables influence belief, attitudes, and intention to use (Davis, 1986; Lai, 2017; Nagy, 2018; Park, 2009; Willis, 2018). External variables affect intention and actual use through mediated effects (Park, 2009; Willis, 2018). These variables include perceived usefulness (PU) and the perceived ease of use (PEOU) as related to the adoption and utilization of a new technology. It is important to understand the determinants of perceived usefulness and ease of use since they drive intention(s) to use (Lai, 2017; Sullivan, 2012; Willis, 2018).

Despite demonstrating its efficacy for determining behavioral intentions, there are limitations to the traditional TAM model. Many TAM studies incorporate the use of self-reported data. Another limitation is new tools/technology adoption are often a distinct matter determined by a small team or even a singular individual within an organization. Regardless of the limitations the classic TAM has been proven statistically significant, as well as a useful model, theorizing an individual's perception of the utility of a given technology impacts their intent to use it (Davis, 1986; Lai, 2017; Sullivan, 2012; Willis, 2018). Researchers continue to assert TAM is an effective model and framework to predict adoption and implementation.

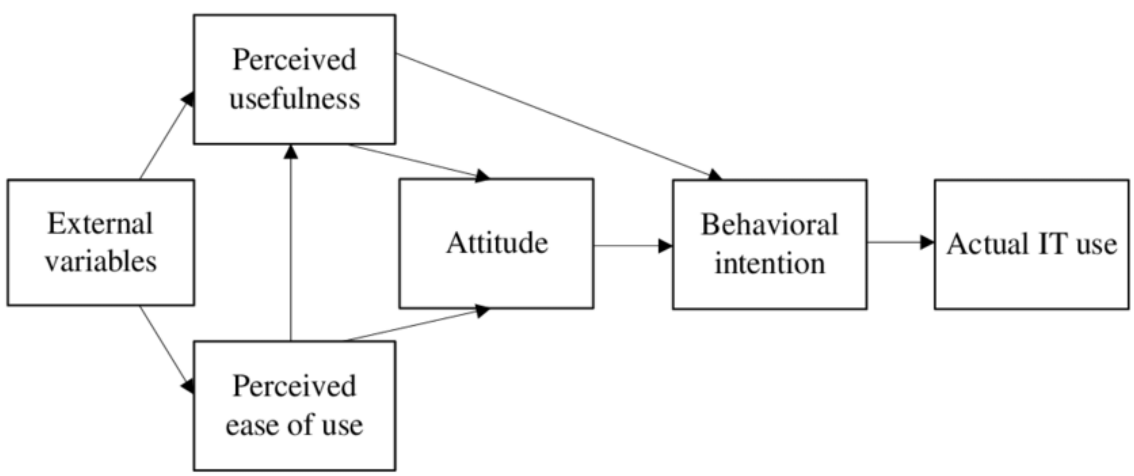


Figure 4. Technology Acceptance Model—TAM (Davis, 1989).

<u>The Extended TAM Model (TAM2)</u>

Venkatesh and Davis (2000) developed an extension to TAM that outlined perceived usefulness and usage intentions as they related to the process of social influence and cognitive instrumental processes. Social influence processes included social norm, voluntariness, experience, and image while cognitive instrumental processes included job relevance, output quality, result demonstrability, and perceived ease of use (Sullivan, 2012). Defined social norms remained consistent with previous TAM models, however it is interesting to note the direct compliance-based effect of social norm on intention, PU, and PEOU are more likely to occur in mandatory, not voluntary, system usage settings (Lai, 2017; Rhodes & Courneya, 2003; Sullivan, 2012). Therefore, TAM2 models depict voluntariness as a moderating variable. The last of the three interrelated social influences is image. Social norms positively influence image or the degree to which utilization of technology enhances one's repute among peers. Job relevance, output quality, result demonstrability, and PEOU are a series of determinants of PU in the TAM2 model (Lai, 2017; Sullivan, 2012). Job relevance refers to the perception of an individual in terms of a technology's relation to and ability to aide in job function. Output quality is the individual perception of how the technology will aide in task completion. And finally, result demonstrability suggests individual users will have an increasingly positive outlook of PU when usage related results are quickly and easily identifiable. PEOU assesses how uncomplicated the technology is to use. TAM2 postulates all cognitive instrumental processes influence the PU and subsequently the individual user's intention to adopt and use a new technology. Once a new technology/system is adopted and implemented by a group or team the social influence processes should be expanded beyond the scope of TAM2 (Davis, 1989; Fishbein & Ajzen, 1975; Lai, 2017; Rhodes & Courneya, 2003; Sullivan, 2012.

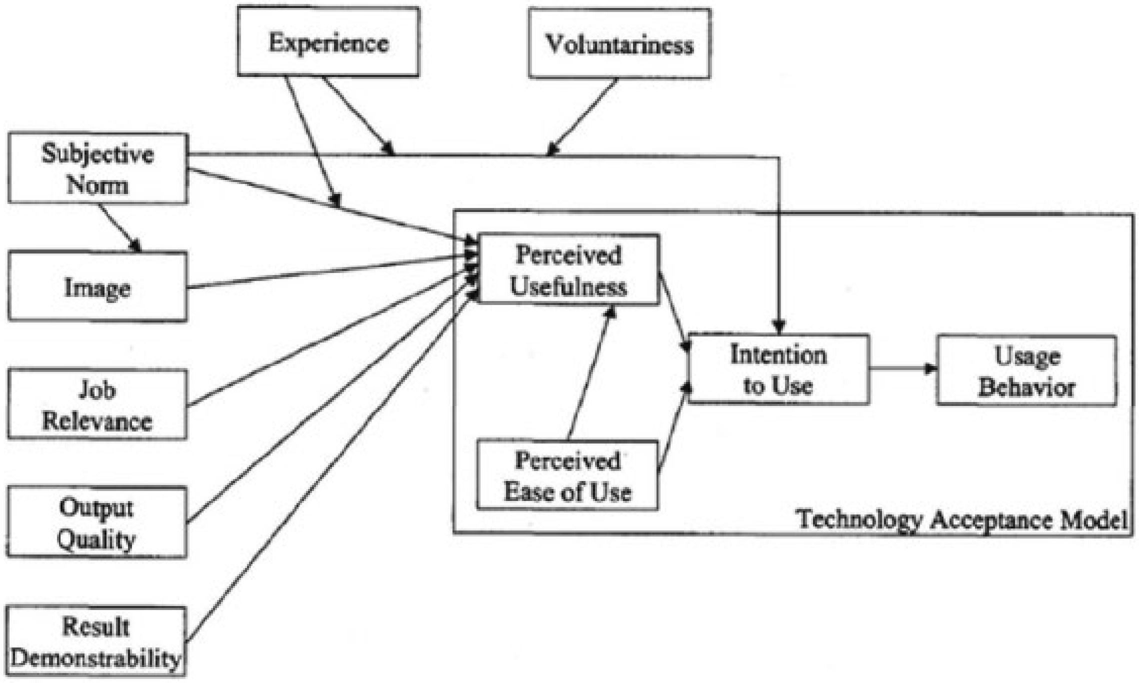


Figure 5. The Extended TAM Model—TAM2 (Venkastesh & Davis, 2000).

Unified Theory of Acceptance and Use of Technology (UTAUT)

TAM and TAM2 models were created to assist with understanding individual user responses to new technologies. Due to limitations in the TAM and TAM2 measurements and constructs, a holistic perception of user adoption and use were not always fully developed (Lai, 2017; Venkastesh & Davis, 2000). In 2003 Venkatesh et al., proposed an amalgamated model known as the unified theory of acceptance and use of technology (UTAUT). The UTAUT integrates eight established models including the TRA, TPB, and the TAM. This unified model is comprised of four constructs: facilitation conditions, efforts expectance, performance expectance, and social influence. Venkatesh et al. (2003) defines these constructs as:

1. Facilitation conditions: The extent to which an individual user believes conditions are appropriate for effective use of the technology, including the

organizational inclination and infrastructure. *Derived from perceived behavior control and TAM.*

2. Effort's expectance: The extent to which an individual user believes the technology will be easy to use. *Derived from the TAM.*

3. Performance expectance: The extent to which an individual user believes the technology will enhance their work performance. *This construct is known as perceived usefulness in TAM.*

4. Social influence: The extent to which an individual user believes others consider the technology to be worthwhile and would advocate for adoption. *This construct includes items from subjective norms in TAM.*

Despite the usefulness of the UTAUT in studying the acceptance of technology, it is limited due to a lack of task-technology fit inclusion. The task-technology fit theory claims the likelihood technology will have a positive impact on performance and truly be used is driven by the match of technology capabilities and user task (Goodhue, & Thompson, 1995; Lai, 2017; Sullivan, 2012).

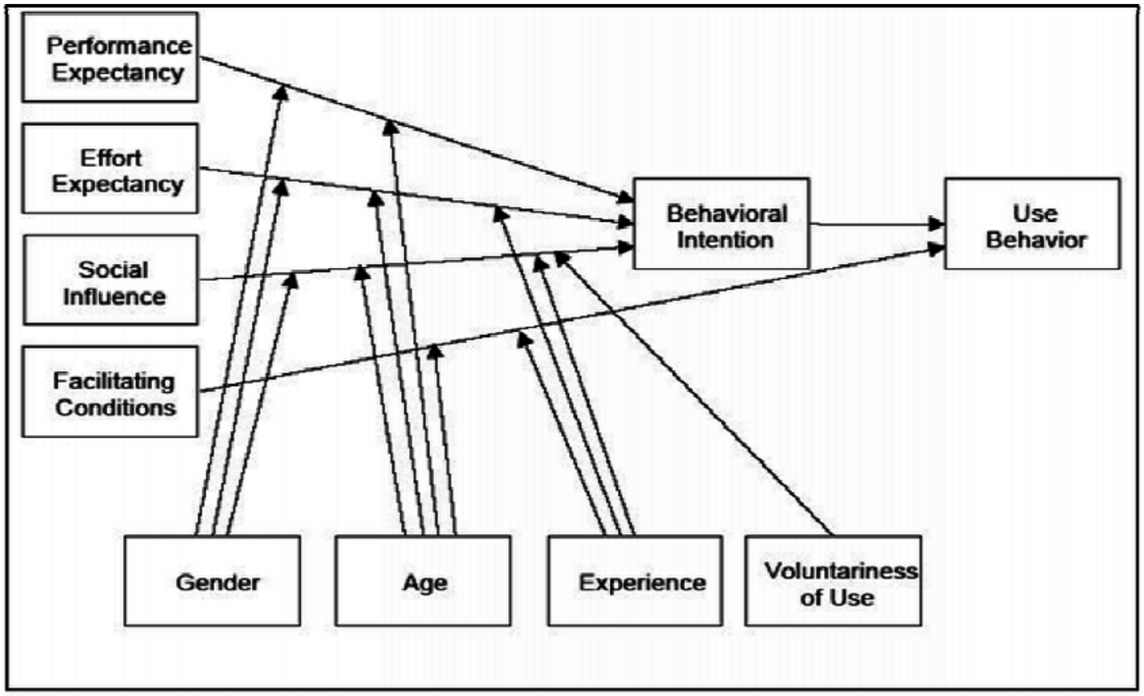


Figure 6. The Unified Theory of Acceptance and Use of Technology—UTAUT (Venkatesh et al., 2003).

Personality Characteristics

Understanding personalities can provide insight to human qualities such as leadership, motivation, and empathy. Developing an understanding of traits, personality typology, and thinking styles can improve personal, as well as team motivation and self-behavior. Additionally, it is helpful for appreciating individual differences, value, strengths, weaknesses and strengthens preferred styles for communication, learning, management, and teamwork (Ali, 2009; Ashton, 2018; Boyle et al., 2008; Coulacoglou & Saklofske, 2017; Sutton et al., 2013; Vîrgă et al, 2014).

A multitude of personality and motivational models and theories exist, each one offering a different perspective. These behavioral and personality models are widely used in organizations to aid in understanding, explaining, and managing communications and relationships (Ali, 2009; Ashton, 2018; Barak, 2011; Boyle et al., 2008; Coulacoglou &

Saklofske, 2017; Eysenck & Eysenck, 1965; Eysenck, 1996; Harris & Eikenberry, 2020; Smith et al., 2019; Sutton et al., 2013; Vîrgă et al, 2014).

Personality Type Models

Myers Briggs® Type Indicator (MBTI®)

The Myers Briggs® Type Indicator (MBTI®) is a widely used and well-regarded system for understanding and interpreting personality. The purpose of the MBTI® is to make the theory of personality types comprehensible, advantageous and clarifying that random variations in behavior are orderly and consistent. The MBTI® was developed by Briggs and Briggs-Myers in 1942. It uses a four-scale structure to identify and categorize individual preferences. Each scale represents two opposing preferences or styles, as shown in Table 1 (Ashton, 2018; Barak, 2011; Boyle et al., 2008; Coulacoglou & Saklofske, 2017; Sutton et al, 2013; Vîrgă.et al, 2014).

Table 1 MBTI® Personality Styles (Ashton, 2018; Boyle et al., 2008; Coulacoglou & Saklofske, 2017)

Definition	Personality Style(s)	
How an individual directs attention and energy.	Extraversion (E)	Introversion (I)
	Individuals get their energy from the outer world of people, activities, and things.	Individuals get their energy from the inner world of ideas, pictures, memories, and thoughts.
How an individual observes the world.	Sensing (S)	Intuition (N)
	Individuals pay attention to the physical reality including sight, sound, touch, taste, and smell.	Individuals pay attention to the impressions, meanings, and patterns of the information they receive.
How an individual makes decisions.	Thinking (T)	Feeling (F)
	Individuals use basic truth and principle to make decisions regardless of the situation; consistent and logical.	Individuals use the perspectives and emotions of others to make decisions; establishing and maintaining balance.
How an individual orient themselves to life.	Judging (J)	Perceiving (P)
	Individuals prefer a planned and orderly approach to life.	Individuals prefer a flexible and spontaneous approach to life.

According to the MBTI® system everyone is represented by four preferences, one from each scale. By categorizing an individual's overall personality and behavioral style according to the four preferences, the MBTI contains sixteen 'types' each represented by a four-letter series. The sixteen different personality type combinations are typically presented in a MBTI® type table, which often identifies each type with a descriptive label like those outlined in Table 2 (Ashton, 2018; Barak, 2011; Boyle et al., 2008; Coulacoglou & Saklofske, 2017; Sutton et al, 2013; Vîrgă.et al, 2014).

Table 2 MBTI® Type Table (Ashton, 2018; Boyle et al., 2008; Coulacoglou & Saklofske, 2017)

INTJ Architect	ENTJ Commander	INTP Logician	ENTP Debater
INFJ Advocate	ENFJ Protagonist	INFP Mediator	ENFP Campaigner
ISTJ Logistician	ESTJ Executive	ISFJ Defender	ESFJ Consul
ISTP Virtuoso	ESTP Entrepreneur	ISFP Adventurer	ESFP Entertainer

<u>Eysenck's Personality Inventory and the Four Temperaments</u>

Eysenck used extensive research and questionnaires to build a personality inventory connected to but distinctly different from previous models. Eysenck's model explores and analyzes personality related to emotional stability. This model was uniquely different, it was the first mathematically scalable method. Eysenck's theory measures personality using two scales; (1) introversion and extraversion (2) stable/unemotional and unstable/emotional. Using these scales, the model produced four main types of personality shown in Table 3 (Barak, 2011; Boyle et al, 2008; Eysenck & Eysenck, 1965; Eysenck, 1996; Taub, 1998).

Table 3 Eysenck's Four Types (Boyle et al, 2008; Eysenck & Eysenck, 1965; Eysenck, 1996; Taub, 1998)

Stable–extraverted Sociable Outgoing Talkative Responsive Easy-going Carefree	Stable-introverted Calm Even-tempered Reliable Careful Peaceful Thoughtful
Unstable-extraverted Touchy Restless Aggressive Excitable Impulsive Optimistic	Unstable-introverted Moody Anxious Rigid Reserved Unsociable Pessimistic

DISC

The DISC model and assessment instrument was published by the US Inscape Publishing company. Unlike the MBTI® which matches individuals to defined 'types', the DISC model presents a set of four 'type' descriptions (Dominance, Influence, Steadiness, and Compliance). The DISC assessment tool identifies an individual's dominant or preferred type along with one-two supporting types. This mixture of types is then represented graphically and/or a personality narrative is provided based on the mix. Therefore, no one individual is exclusively one of the four DISC personality types (Ashton, 2018; Barak, 2011; Harris & Eikenberry, 2020; Slowikowski, 2005).

The "Big-Five" Factors Personality Model

The Big-Five provides an accurate and reliable method to assess the driving traits of an individual's personality. This model has been well validated and has shown correlations to job performance. The Big-Five is a universal accepted term for the model outlining five basic traits of personality. The Big-Five embody vital traits that can be found at the center of multiple personality assessment tools. Individual personality traits become increasingly more fixed, stable, predictable, and reliably measured as individuals age. There have been numerous translations of the Big-Five model, each translation with a different set of terms. The words describing the traits change, but the underlying traits remain. The combinations of factors define the individual personality, not the score of a single scale (Smith et al, 2019; Sullivan, 2012; Johnson, 2017).

- Extraversion/Introversion: Open and talkative/Reserved and quiet
- Neuroticism/Stability: Anxious and hesitant/Confident and decisive
- Conscientiousness: range in approach to work; flexible and informal to a structured approach.
- Agreeableness: range of approaching others; empathetic and collaborative to self-reliant and independent
- Openness to experience: range of approach to tasks; idealist and creative to conservative and serious.

A New Generation of Students

Many students today are considered part of a distinct cohort known as ‘digital natives.’ They spend more time interacting with digital media than traditional cognitive materials, such as textbooks, and use computers or mobile devices to complete activities. This cohort requires more interactive and student focused learning (Johnson et al., 2013; Smith, 2012; Oriji & Efebo, 2013; Kivunja, 2014). The characteristics of this cohort have created a demand for educators to integrate new techniques with curriculum to address the innovative needs and desires of students. It is paramount that educators develop learning and teaching approaches that support students, keeping them engaged and motivated (Johnson et al., 2013; Nachimuthu & Vijayakumari, 2011; Huber et al., 2012; Smith, 2012; Hess & Gunter, 2013; Oriji & Efebo, 2013; Kivunja, 2014).

Video and case-based education has increased in popularity among various age groups and populations (Johnson et al., 2013). Due to this peaked interest and a need for additional learning opportunities, educators are seeking new ways to integrate case studies and videos with educational content to improve the appeal of curriculum to students.

Student perceptions have been found to be favorable surrounding utilization of educational video and case studies (Johnson et al., 2013; Nachimuthu & Vijayakumari, 2011; Huber et al., 2012; Kopp & Hanson, 2012; Chiniara et al., 2013; Hess & Gunter, 2013; Katz et al., 2013). Video case-based education can allow students the opportunity to interact with content in a manner that is meaningful to them, applicable to their academic and professional goals, and do so in a variety of settings (Johnston et al., 2013; Katz et al., 2013).

In comparison to simulation, which has long been considered the gold standard in paramedic education, there is a paucity of research on the use of VAPE (Kopp & Hanson, 2012; Chiniara et al., 2013). This gap, coupled with the lack of available VAPE, suggests that there is a need for development and study of additional educational modalities in paramedic education (Chiniara et al., 2013; Johnston et al., 2013; Katz et al., 2013).

Theoretical Framework

The rationale for why users accept and use or reject a system is one of the more complex questions in information systems. This study broadens current acceptance models by proposing additional constructs may be correlated to acceptance and behavioral intention to use VAPE in EMS education.

Researchers have extensively studied the impact of user affective domain on their technology acceptance and usage behavior. Mixed in the numerous theories used by researchers is the TRA which is well researched and proven successful in predicting and explaining behaviors across a wide variety of occupations (Davis, 1986; Davis, 1989;

Lai, 2017; Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Venkatesh & Davis, 2000; Willis, 2008). Davis (1986) ultimately developed the TAM from the TRA focusing on information systems. Davis (1986) proposed that user attitudes regarding a given technology were comprised of two major beliefs: PU and PEOU. These two beliefs are set by the user's response to external factors, which may be related to the system/technology features and environment. TAM assumes usage is determined by behavioral intention, which, is determined by attitude and PU. Therefore, users form an intention to use a given technology/system when they find it increases their job performance, regardless of how they feel about it. The distinguishing difference between TAM and the original theoretical model, TRA, is the omission of social norms. Davis suggests the impact of social norms on attitude is indirect at best and PU, as well as PEOU allow for improved tracing of external variables and their impact on behavioral use (Davis, 1986; Davis, 1989; Lai, 2017; Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Venkatesh & Davis, 2000; Willis, 2008).

This study expanded on traditional versions of technology acceptance models through inclusion of PU, PEOU, prior experience, technological competency, social norms, and personality characteristics.

Chapter Two Summary

Despite advances in the scope of practice at every credentialing level, an expanding educational curriculum, and project planning implemented more than a decade ago, EMS education has failed to revolutionize (Brooks et al., 2016; Brown et al., 1996; CoAEMSP, 2005; NHTSA, 2004; NHTSA, 2009a; NHTSA, 2009b; NHTSA, 2009c; NHTSA, 2019; NCOEMS, 2020). This failure is further amplified by changing educational needs and preferences of modern students, lack of training and support for EMS educators, and progressive difficulty in accessing meaningful clinical experiences (Akl et al., 2013; Brooks et al., 2016; Brown et al., 1996; Cicero et al., 2017; Greenblat, 2001; Keppell et al., 2001; Kivunja, 2014; Kron et al., 2010; Marshall, 2002; McKenna et al., 2015; Oriji & Efebo, 2013; Riley et al., 2004; Ruple et al., 2005a; Ruple et al., 2005b). While prehospital education has readily adopted various degrees of simulation, the application is questionable as many educational programs report unfamiliarity with how to work simulators expressing these tools are often left sitting in supply rooms unused (Brooks et al., 2016; Karakus et al., 2014; McKenna et al., 2015; Ruple et al., 2005a; Ruple et al., 2005b). If future EMS providers are to receive an education that prepares them to perform their roles, the design and implementation of EMS education must change. Analysis of the motivation for adoption, specific methods of implementation, and impact of various technologies is crucial to ensuring a curriculum design that meets the requirements of administrative bodies and students. Outside of simulation, research surrounding other technologies in EMS education is scarce. This study provides insight on factors affecting the intention to use and behavioral use of VAPE by faculty/staff for EMS education.

The TAM (and a multitude of extended TAM versions) has long been employed and accepted as a valid and reliable measure of intention to use, adoption, and behavioral usage for an array of technologies (Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). This study utilized a novel extended version of TAM incorporating PU, PEOU, prior experience, technological competency, social norms, and personality characteristic constructs of EMS education program faculty and staff into a single model. PU, PEOU, and social norms are factors included in traditional TAM models. They assess the impact of user perceptions of effort required to use, efficacy of a given technology, and peer opinions on the adoption and behavioral use of technologies (Ajzen, 2005; Fishbein & Ajzen, 1975; Lai, 2017; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). Prior experience included not only previous use or knowledge of VAPE but also prior experience as an EMS provider and educator. Technological competency was reported through concepts of access, training, and use. Personality was assessed with the FFM, a numeric value will be reported for extraversion, neuroticism, openness, agreeableness, or conscientiousness. Relationships between attitude (measured as PU and PEOU) and social norms, personality, technological competency, and prior experience were evaluated, as well as the relationship between technological competency and prior experience. This model analyzed the impact of each factor on user intention to use and in cases of existing adoption, the behavioral use of VAPE.

An online survey was deployed to collect data from academic professionals working with or teaching for an accredited EMS education program. Results were analyzed using SPSS through a path analysis, determining if correlations exist between model constructs and faculty/staff intention to use. Examining factors that influence technology acceptance can increase understanding of adoption and utilization practices in EMS education. The next chapter, methodology, provides detailed discussion and rationale of the research design, participants, data collection, statistical analysis, ethical considerations, and limitations.

CHAPTER THREE: METHODOLOGY

Introduction

Due to the intricacies of clinical education for prehospital providers, as well as the delicate nature of agreements between clinical sites and educational institutions, students experience an insufficient number of hands-on patient interactions and treatments (Chiniara et al., 2013; Lazarou, 2011). Therefore, students are not able to fulfill certain learning objectives proposed by the curriculum. Regardless of type, adjunctive teaching methods and tools are intended to supplement the growing gap between clinical education and traditional cognitive teaching methods (Chiniara et al., 2013; Kopp & Hanson, 2012).

A dearth of clinical experience combined with outdated teaching methods, limited educator training, an evolving scope of practice, changing student preferences, and the neglected analysis of alternate teaching and learning methods to include the integration of educational technologies necessitates that further research in EMS education is pressing (Akl et al., 2013; Brooks et al., 2016; Brown et al., 1996; Cicero et al., 2017; Greenblat, 2001; Keppell et al., 2001; Kivunja, 2014; Kron et al., 2010; Marshall, 2002; McKenna et al., 2015; Oriji & Efebo, 2013; Riley et al., 2004; Ruple et al., 2005a; Ruple et al., 2005b).

Educational technologies can provide countless opportunities for students to interact with content and environments that are directly applicable to their academic and professional endeavors, creating a space to obtain experience. These experiences can include simulated patient encounters, assessments, critical thinking and problem solving, and the opportunity to test their competence in a leading role (Albanese, 2005; Akl et al., 2013; Chiniara et al., 2013; Cicero et al., 2017; Greenblat, 2001; Hassoulas et al., 2017; Hess & Gunter, 2013; Huber et al., 2012; Ikegami et al., 2017; Johnston et al., 2013; Karakus et al., 2014; Katz et al., 2013; Keppell et al., 2001; Kim et al., 2001; Kopp & Hanson, 2012; Kron et al., 2010; Leng et al., 2007; Malone et al., 2010; Mashall, 2002; McCoy et al., 2019a; McCoty et al., 2019b; McLaughlin et al., 2010; Nagy, 2018; Riley et al., 2004; Seamon et al., 1997). VAPE can allow students a low stress environment where they can make judgments regarding patient care without concern of injury to the patient or failure to perform on their part. This can allow for student conceptualization and reflection on the learning process, an increase in student confidence and motivation, and an increase in clinical performance. VAPE have the potential to require the use of strategizing, hypothesis testing, and problem-solving, usually with higher order thinking rather than rote memorization or simple comprehension (Albanese, 2005; Hovland et al., 1949; Ikegami et al., 2017; Johnson et al., 2016; Kron et al., 2010; Leng et al., 2007). A reservoir of research exists on the use of video in education, as well as case-based learning and various types of simulation supporting a positive impact on student engagement, motivation, and learning. However, the vast majority of existing video and case-based research makes use of actors and scripted performances with specified outcomes (Albanese, 2005; Hansen et al, 2005; Hassoulas et al., 2017; Hovland et al., 1949; Ikegami et al., 2017; Johnson et al., 2017; Johnson et al., 2019; Kron et al., 2010; Leng et al., 2007; Thomas et al., 2001; Williams, 2000; Williams, 2005). This study examined the intent to use and behavioral use of recordings consisting of genuine patients who are experiencing medical and traumatic symptoms in actual events.

The most widely used model for explanation of technology acceptance, intention to use, and behavioral use is the technology acceptance model (TAM). The TAM theorizes the individual's perception of utility, their intent to use, and behavioral use of a given technology. This study utilized a unique and inclusive model based on an extension of the TAM. TAM constructs including perceived usefulness (PU) and perceived ease of use (PEOU) will be included as explanatory factors (Davis, 1986; Davis, 1989; Fishbein & Ajzen, 1975; Lai, 2017; Nagy, 2018; Rhodes & Courneya, 2003; Sullivan, 2012; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Willis, 2008). Additional constructs included prior experience, technological competency, social norms, and personality characteristics as determined by the Five Factor Model (FFM). There are relatively few studies based on the TAM with the purpose of analyzing video acceptance, focusing on affective constructs such as personality characteristics, or which focus on faculty/staff intent to use over the learner. This study is distinctive in its extension of the TAM model and analysis of prior experience, technological competency, social norms, and personality characteristics as factors impacting the intention to use a library of VAPE by EMS education program faculty/staff.

Table 4 Logic Model

Extended TAM for Authentic Patient Video Cases in EMS Education Logic Model The purpose of this study is to examine the intention and behavioral use of VAPE for prehospital provider education by EMS education program faculty and staff.				
Inputs	Participants	Activities	Outputs	Outcomes
An extensive library of authentic patient video cases provided through ReelDX software application.	Academic professionals who are currently working with or teaching for an accredited prehospital EMS education program and are involved in the design or instruction of curriculum.	Survey Part I: Attitude Survey Part II: Demographics & Prior Experience Survey Part III: Technological competency Survey Part IV: Social Norms and Personality	An extended technology adoption model applied to the behavioral intention and use of authentic patient video cases by EMS educators.	Identification of factors impacting the intention of EMS educators to adopt and use authentic patient video cases in EMS curriculum design. Completion of a foundational study identifying the need for further research.

Statement of the Problem

EMS education is in arrears and programs face potential failure to meet guidelines and standards (Brooks et al., 2016; Brown et al., 1996; CoAEMSP, 2019; McKenna et al., 2015; NHTSA, 2009a; NHTSA, 2010; NHTSA, 2009b; NHTSA, 2019; NHTSA, 2009c; NHTSA, 2020; Ruple et al., 2005a; Ruple et al., 2005b). Many programs report inadequate training and support for advanced technologies that could enhance their curriculum (McKenna et al., 2015). Evaluation of adjunctive teaching methods is required to provide insight for meaningful change. This is essential particularly when most educational programs have been forced into hybrid or fully online environments due to the COVID-19 pandemic.

A paucity of research exists in EMS education, especially in technology adoption and use outside of simulation. Videos of unscripted authentic patient encounters recorded in actual clinical settings can provide students with unique and directly applicable learning opportunities. The purpose of this study was to examine the intention to use and behavioral use of VAPE for prehospital provider education by EMS education program faculty and staff.

Research Questions and Hypotheses

The following questions were addressed:

1. Do the attitudes of EMS education program faculty/staff regarding PU impact intention to use and behavioral use of VAPE?

$H1_0$: The PU of VAPE will not be associated with an increased intent to use and behavioral use of.
$H1_1$: The PU of VAPE will be associated with an increased intent to use and behavioral use of.

2. Do the attitudes of EMS education program faculty/staff regarding PEOU impact intention to use and behavioral use of VAPE?

$H2_0$: The PEOU of VAPE will not be associated with an increased intent to use and behavioral use of.
$H2_1$: The PEOU of VAPE will be associated with an increased intent to use and behavioral use of.

3. Do social norms impact the intention to use and behavioral use of VAPE by EMS education program faculty/staff?

$H3_0$: The perception of social pressure to use/not use VAPE will not be associated with an increased intent to use and behavioral use of.
$H3_1$: The perception of social pressure to use/not use VAPE will be associated with an increased intent to use and behavioral use of.

4. Does personality characteristics impact intention to use and behavioral use of VAPE by EMS education program faculty/staff?

$H4_0$: The users personality characteristics will not impact their intention to use and behavioral use of VAPE.
$H4_{1:}$ The users personality characteristics will impact their intention to use and behavioral use of VAPE.

5. Does technological competency (self-efficacy) impact the likelihood of intention to use and behavioral use of VAPE by EMS education program faculty/staff?

$H5_0$: The users' technological competency will not impact their intent to use, and behavior use of VAPE
$H5_1$: The users' technological competency will impact their intent to use, and behavior use of VAPE

6. Does the prior experience of EMS education program faculty/staff impact the likelihood of intention to use and behavioral use of VAPE?

$H6_0$: The prior experience of faculty/staff will not impact their intention to use and behavioral use of VAPE.
$H6_1$: The prior experience of faculty/staff will impact their intent to use and behavioral use of VAPE.

Research Methodology

This study employs quantitative survey research methods. Quantitative research methods are used to determine if a relationship exists between two or more variables, are effective at studying large samples, and generalizing. Quantitative research makes use of objective measurements and the mathematical and/or statistical analysis of collected data (Campbell & Stanley, 1966).

Survey research can be a rigorous approach to research outlining who to include, what and how to distribute, and when to send the initial survey and follow up responses. Survey research involves the collection of data from a sample of a specified population via responses to a predetermined set of questions. Survey research permits the use of a variety of recruitment methods, data collection, and accommodates numerous methods of instrumentation. Survey research can involve quantitative methods, qualitative methods, or mixed methods. This type of research generally involves large population-based data collection that is relatively expedient. The goal of survey sampling is to obtain enough of a sample of participants that is representative and sharing similar characteristics of the population of interest. A large sample increases the likelihood responses will accurately reflect the entire population. While survey research can utilize a variety of data collection methods, the most used methods include questionnaires and interviews. Delivery modes can also vary widely including paper forms, email, internet-based surveys, or some combination (Campbell & Stanley, 1966; Fowler, 2014).

The original TAM studies utilized a quantitative survey methodology, the questionnaire-based survey method. This method seemingly dominates TAM based research (Davis, 1986; Davis, 1989; Lai, 2017; Nagy, 2018). Quantitative survey methods are well suited to investigating socio-psychological factors involved in user acceptance of technology systems, as well as affective aspects of education (Campbell & Stanley, 1966; Fowler, 2014).

Research Design

A cross-sectional questionnaire-based survey design is suitable for this research study. In a cross-sectional survey design data is collected during a specified period or at one point in time. This provides the opportunity to evaluate current attitudes and practices surrounding VAPE, in a short amount of time. It allows participants to report directly on their own thoughts, feelings, and behaviors as they regard the adoption and behavioral use of VAPE. This information may provide useful to decision makers for curriculum designers, software developers, and educational programs. Additionally, this methodology addresses the issue of sampling. A considerable sample will provide the most accurate estimate of what is true in the population (Campbell & Stanley, 1966; Fowler, 2014). There are 642 accredited EMS education programs across the nation, each of which should have one or more faculty/staff members. A cross-sectional questionnaire-based survey method allows for straightforward access to this large sample with minimal effort compared to other methods.

There are multiple sources of error and bias in survey research such as coverage, sampling, measurement, and nonresponse errors. Strategies for reducing these errors were implemented to draw appropriate conclusions about the data collected (Campbell & Stanley, 1966; Fowler, 2014). These included a clearly identified population of interest and a large sample drawn from the Commission on Accreditation of Allied Health Education Program website for accredited EMS programs, the use of valid and reliable instruments, a user-friendly survey design, and follow up procedures for study participants.

Description of the Participants and Their Context

Study participants included academic professionals currently working with or teaching for an accredited prehospital EMS education program and are involved in the design or instruction of curriculum. Participants held at least one credential that rendered them as qualified educators such as state and/or national Paramedic, state and/or national EMS instructor, Registered Nurse (RN), Physician Assistant (PA), Doctor of Osteopathic medicine (DO), and/or Doctor of Medicine (MD). Study participants were asked to complete an online survey consisting of four parts that collected data related to attitude, demographics and prior experience, technological competency, social norms, and personality.

It is assumed the sample of educators are (1) representative of the entire population of EMS education program faculty and staff; (2) on some level, are involved in the design or instruction of EMS curriculum; (3) have the means to respond to the electronic survey; (4) participated truthfully and with integrity, without influence or interference from others.

Instrumentation or Sources of Data

A VAPE user adoption and utilization questionnaire was used to conduct the study. It consists of established measures of PU, PEOU, social norms, and personality. Additional questions about prior experience and technological competency were developed by the researcher. These factors were used to examine the relationship of acceptance and behavioral usage of VAPE to the characteristics of EMS educational program faculty and staff. The survey is structured in four parts; Part I: attitude (perceived usefulness, perceived ease of use), Part II: demographics and prior experience, Part III: technological competency, Part IV: social norms and personality. All factors, apart from Part II, are measured on a five-point Likert-type scale. Items in Part II are measured as multiple-choice questions. The questionnaire takes a maximum of 20 minutes to complete. At the conclusion of the survey the participant was assured information provided would remain confidential. Survey questions by dimension are outlined in Appendix B.

Variables

The independent variable in this study include attitude consisting of PU and PEOU, social norms, personality traits as determined by the FFM, technological competency, and prior experience. Dependent variables included intention to use and subsequently behavioral use. Dependent variables were measured using a combination of constructs modified from existing adoption models.

Measures

Perceived Usefulness

The extent to which an individual believes use of a given technology will improve their performance/aide in task completion is considered PU (Johnson et al., 2019; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). In this study, the user's work goal is an improved overall course design and increased student engagement, motivation, and learning. The four-question perceived usefulness measure developed by Davis (1989) have been extensively studied and were used as a basis for this study with modification.

<u>Perceived Ease of Use</u>

An individual's discernment of the degree of difficulty in utilizing a given technology is considered PEOU (Nagy, 2018; Park, 2009; Willis, 2008). The questions were modified to apply to application and use of VAPE made available by ReelDX.

<u>Demographics and Prior Experience</u>

Demographics (age, gender, education, etc.) will be collected and analyzed to determine impact on model factors, intention to use, and behavioral use of VAPE. Prior experience examines user experience as a clinician and educator.

<u>Technological Competency</u>

Technological competency denotes a user's ability to utilize a given technology. It includes relevant skills and knowledge required to implement technology in the creation and application of learning items (Johnson et al., 2019; Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Willis, 2008). Items addressing technological competency were developed by the researcher to measure user technological competency/self-efficacy.

<u>Social Norms</u>

Social norms can be defined as an individual's judgement of peer opinions regarding what "should" or "should not" be done, or the influence of others. Social norms stem from the user understanding of expected and appropriate behavior (Willis, 2008; Johnson et al., 2019; Nagy, 2018; Park, 2009; Rhodes & Courneya, 2003; Sullivan, 2012; Willis, 2008). The questionnaire included two questions related to the influence felt by the user to adopt and use VAPE in EMS education.

Personality

Personality factors were determined using the Big Five Personality Test, an example of the FFM. This self-report test measures personality traits using the International Personality Item Pool Big-Five Factor Markers. The test consists of fifty items on a five-point Likert scale and takes less than five minutes to complete on average. The survey is free, readily available to the public, is short and concise, and has been extensively studied (Barak, 2011; Johnson, 2017; Lai, 2017; Smith, 2019). All fifty questions were incorporated into the questionnaire and scored by the researcher.

Intention to Use

Intention to use is generally measured using traditional TAM items developed by Davis (1989). The questionnaire asked users to indicate the likelihood they would use VAPE if they had access.

Behavioral Use

Behavioral use of VAPE is expected as many EMS educational programs have moved their course content online due to social distancing requirements resultant of COVID-19. The questionnaire asked users to indicate the frequency with which they utilize VAPE to enhance and deliver content. In addition to the constructs measuring PEOU, PU, social norms, personality, prior experience, and technological competency the association between intent to use and behavioral usage.

Conceptual Framework

Since the inception of Emergency Medical Services, Emergency Medical Technicians, and paramedics the prehospital scope of practice has continually expanded. Concomitantly, the prehospital educational curriculum has expanded (NHTSA, 2004;

NHTSA, 2009a; NHTSA, 2009b; NHTSA, 2009c; NHTSA, 2019). An integral and required component of this expanded prehospital curriculum are patient interactions in clinical environments.

Unfortunately, actual live patient interactions in clinical environments are often difficult for students to obtain (Johnston et al., 2013; Kopp & Hanson, 2012). Relationships between educational institutions and clinical affiliate sites are often tumultuous. Clinical site affiliates often prohibit student interactions with high-acuity patients for safety and liability reasons. As a result, some students find themselves uncomfortable or insecure concerning their abilities, skill set, and experience when treating patients (Chiniara et al, 2013; Johnston et al., 2013; Kron et al., 2010; Kopp & Hanson, 2012). Compounding the problem is the recent increase in student enrollment in EMS education programs, as well as other healthcare programs, which creates competition for the limited space available at clinical sites (Chiniara et al., 2013; Lazarou, 2011). These limited patient interactions may keep students from obtaining required minimum interactions and skill acquisitions. This produces a dilemma for EMS educators who are responsible to ensure students meet requirements and are competent to care for patients.

A variety of patient types and acuity levels can now be simulated in the educational laboratory settings with high-fidelity simulators (Akl et al., 2013; Chiniara et al., 2013; Greenblat, 2001; Hess & Gunter, 2013; Kopp & Hanson, 2012). Simulation has become the gold standard in EMS education. Regrettably, even though there have been increased curriculum requirements, the creation of accrediting bodies, national educational agendas, and advances in educational technologies (including simulation)

EMS teaching practices have remained relatively unchanged for decades (Brooks et al., 2016; NHTSA, 2004; NHTSA, 2009a; NHTSA, 2009b; NHTSA, 2009c; NHTSA, 2019; Ruple et al., 2005a; Ruple et al., 2006). EMS educators report underutilization of available technologies due to lack of training and support (McKenna et al., 2015). It is imperative EMS educators find ways to cover curriculum content introducing students to required patient types and conditions.

Compounding the problem further is a significant lack of research in EMS education and prehospital clinical practice. Research needs to be conducted addressing educational technologies in EMS education, why they are selected and adopted, how they are implemented and used, and the impact for students and faculty.

ReelDX is an online software application housing an extensive library of actual authentic patient cases captured in clinical settings (ReelDx, 2020). Video and case-based learning have a long- and well-established history in education (Hovland, Lumsdaine, & Sheffield, 1949). They have been shown to improve student engagement and motivation. Authentic patient video cases can provide a multitude of applicable interactions to students, faculty, and staff (Ikegami, 2017; Johnson et al., 2019; Kron et al., 2010; Marshall, 2002; Nagy, 2018). This educational technology could aid educators in meeting the curriculum demands and ensuring student competency.

TAM, TAM2, and UTAUT have been widely used to gather and analyze user reactions to specific technologies and systems. They are well-established, powerful, reliable, and valid models. These adoption models examine how users are led to accept and use a given technology. Numerous factors affect a user's decision about how and when they will use a technological tool (Lai, 2017; Nagy, 2018; Park, 2009; Sullivan, 2012; Willis, 2008). The goal of this research model was to provide an expansion and explanation of constructs affecting the determinants of authentic patient video case technology acceptance amongst EMS educators.

TAM as defined by Davis (1989) assumed intention was determined by these two major constructs: PU and PEOU. Behavioral intention to use and behavioral use is a measure of the intensity of a user's intention to perform a specified behavior. Based on the original TAM in Figure 4, the conceptual framework of this study was developed, expanding on the classic TAM to make a unique model including prior experience, technological competency, subjective norms, and personality characteristics, and is illustrated in Figure 7.

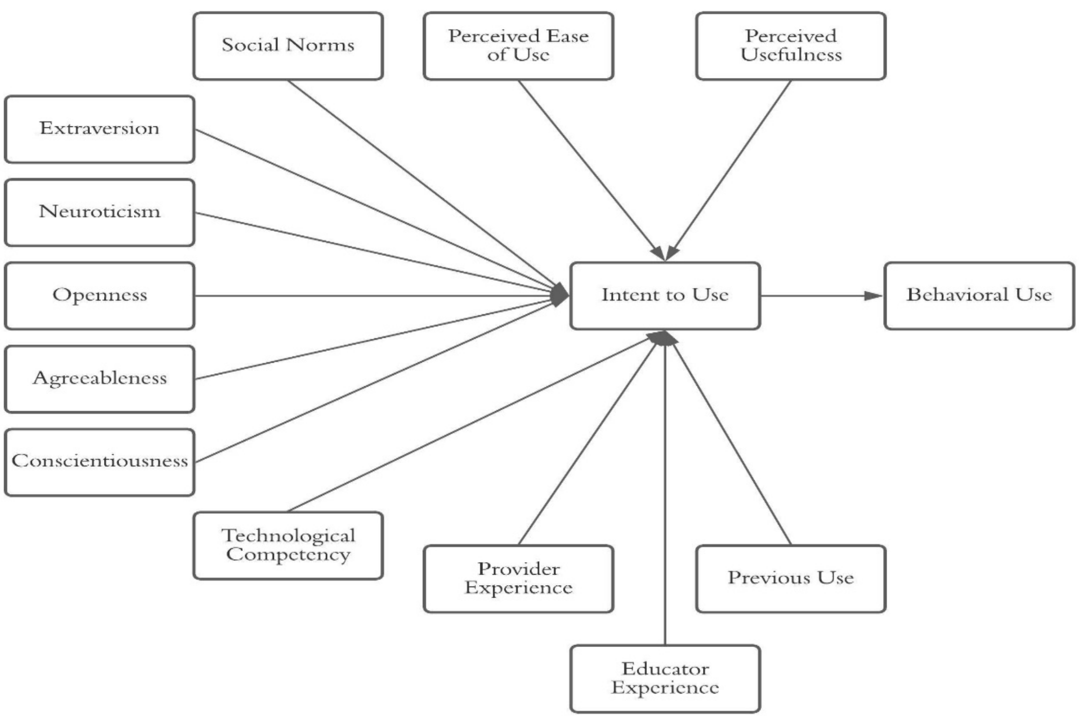


Figure 7. Proposed Conceptual Framework

Based on the conceptual framework used in this study, six hypotheses were formulated:

$H1_0$: The PU of VAPE will not be associated with an increased intent to use and behavioral use of.
$H1_1$: The PU of VAPE will be associated with an increased intent to use and behavioral use of.
$H2_0$: The PEOU of VAPE will not be associated with an increased intent to use and behavioral use of.
$H2_1$: The PEOU of VAPE will be associated with an increased intent to use and behavioral use of.
$H3_0$: The perception of social pressure to use/not use VAPE will not be associated with an increased intent to use and behavioral use of.
$H3_1$: The perception of social pressure to use/not use VAPE will be associated with an increased intent to use and behavioral use of.
$H4_0$: The users personality characteristics will not impact their intention to use and behavioral use of VAPE.
$H4_{1:}$ The users personality characteristics will impact their intention to use and behavioral use of VAPE.
$H5_0$: The users' technological competency will not impact their intent to use, and behavior use of VAPE
$H5_1$: The users' technological competency will impact their intent to use, and behavior use of VAPE
$H6_0$: The prior experience of faculty/staff will not impact their intention to use and behavioral use of VAPE.
$H6_1$: The prior experience of faculty/staff will impact their intent to use and behavioral use of VAPE.

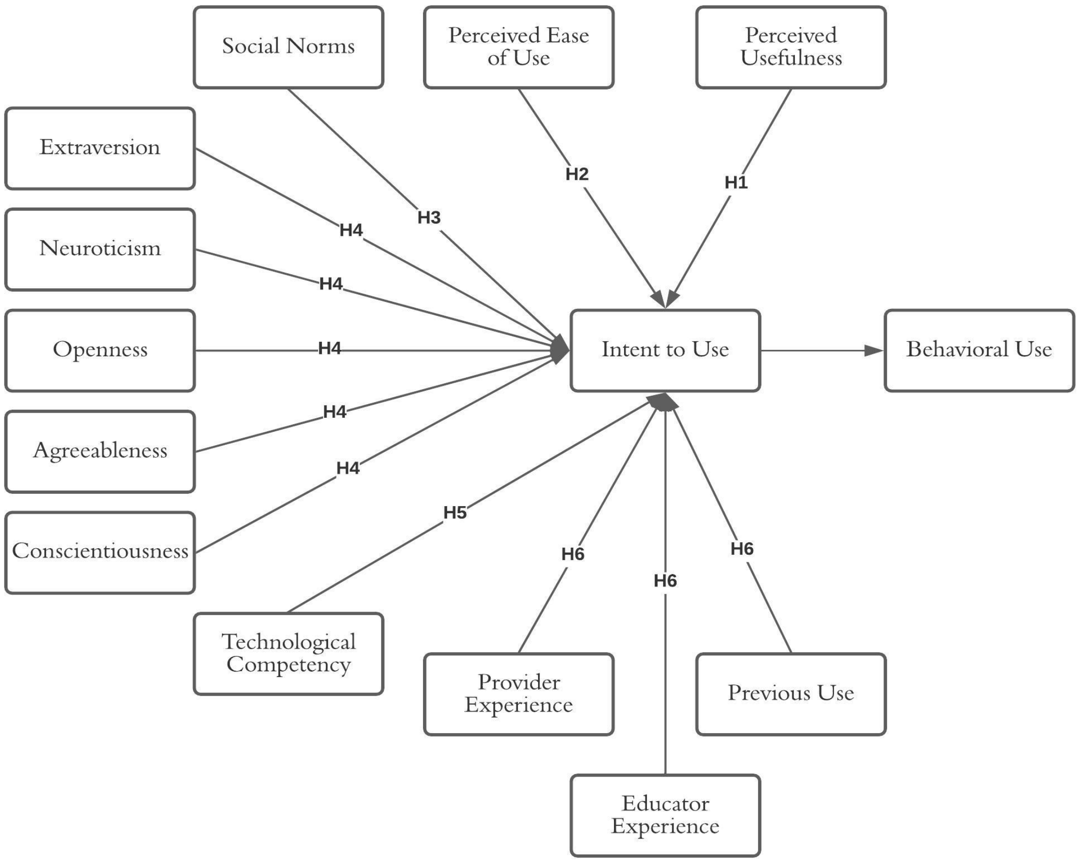


Figure 8. Proposed Conceptual Framework with associated hypotheses

According to Ken Bollen (1989) there are six core components to structural equation modeling 1) specification, 2) identification, 3) estimation, 4) evaluation, 5) re-specification, and 6) interpretation. Re-specification of structural models allows for the evaluation of new hypothesis and enhances understanding of how changes can affect the model. The conceptual framework could be re-specified such that each personality characteristic is an item or component of a factor labeled “Personality.” Personality would be recorded as the most prevalent personality characteristic of each respondent, categorical data. Similarly, provider experience, educator experience, and previous use would be treated as components of a factor labeled “Prior Experience.” These potential changes to the model reduce the factors six 1) PU, 2) PEOU, 3) Social Norms, 4)

Technological Competency, 5) Personality, 6) Prior Experience. Re-specification of the proposed conceptual framework will be evaluated as identified in Figure 9.

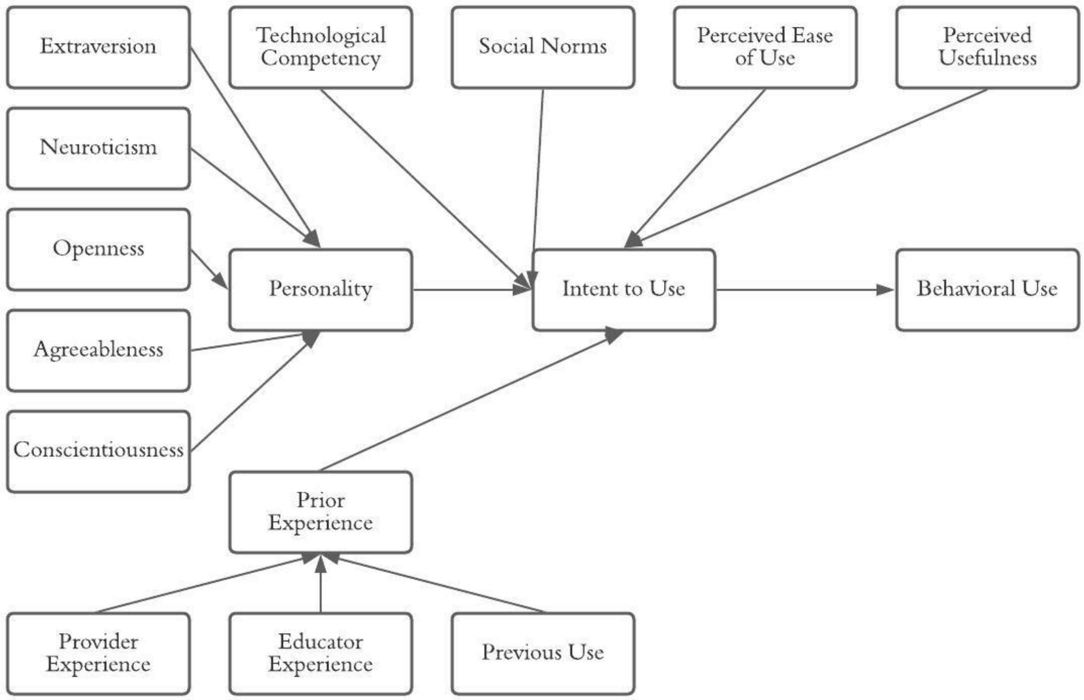


Figure 9. Re-specification of the Proposed Conceptual Framework

Data Management and Collection

A list of currently accredited EMS education programs is available on the CAAHEP website from which contact information was obtained. Each program received an invitation to participate via email (Appendix I). This invitation included a description of the study and directions for participation. Participants had to be at least 18 years of age, considered an academic professional currently working with or teaching for an accredited prehospital EMS education program, and involved in the design or instruction of EMS provider curriculum. Participants held at least one credential that rendered them as qualified educators such as state and/or national Paramedic, state and/or national EMS instructor, Registered Nurse (RN), Physician Assistant (PA), Doctor of Osteopathic medicine (DO), and/or Doctor of Medicine (MD). ReelDX provides an online software application that allows faculty, staff, and students access to a library of VAPE. The sample was administered a survey via Qualtrics, an Internet based survey tool. They were given thirty days to complete the survey. Participants had the opportunity to access the survey twenty-four hours a day. Email reminders were sent weekly, at a minimum, to willing study participants for the duration of the data collection period. Once the data collection period ended the data was retrieved from Qualtrics and imported into SPSS for analysis. Initially the number of participants was insufficient, and the process was repeated for a period of an additional 15 days.

This project underwent review by the Boise State University Institutional Review Board in accordance with the FDA procedures for the Study of Human Subjects. The researcher complied with all facility requests and policy standards while interacting with participants.

Data Analysis and Procedures

Each survey question was assigned a corresponding variable name. Demographic information was collected from multiple choice survey questions. Demographic variables describe the nature and distribution of the sample used with inferential statistics and consists of various types of data including ratio (age) and categorical data (gender). The remainder of the survey instrument utilized a five-point Likert scale. Each point was assigned a numerical value that was used to record the responses to each survey question. Likert-type scales are ordinal data, there is order but the distances between categories is unknown. Variable names and corresponding data types can be found in Appendix A. All data points collected from the survey were exported from Qualtrics to SPSS.

SPSS version 29 was used to analyze all the data collected. Frequencies were completed on each variable. Descriptive statistics (mean, median, mode, and standard deviation) were determined for Age, TeachingTime, and ProviderTime. This initial analysis aided in identification of incomplete/invalid surveys. Surveys that were found to have incorrect or missing data for mandatory items were eliminated from the analysis. These initial statistics also provided a depiction of the sample.

In this study the primary constructs of interest are perceived usefulness, perceived ease of use, social norms, personality, technological competency, and prior experience. The analysis determined the relationships between the constructs and intention to use. Additionally, it determined the relationship between intention to use and behavioral use.

The analysis of data consisted of five steps: (1) a determination of descriptive statistics to describe the sample, (2) Exploratory factor analysis to provide evidence of internal consistency reliability of the scores, and (3) a partial least squares regression analysis, as well as the (4) structured path model for the path analysis, and (5) thematic analysis of qualitative data derived from open-ended survey questions. The descriptive statistics, factor analysis, and PLS regression were computed using SPSS software.

SPSS AMOS is statistical software for covariance (factor) based structural equation modeling. Partial least squares regression is variance (composite) based structural equation modeling. PLS is suitable for smaller sample sizes (AMOS requires large sample sizes of 200-300), predicts and identifies relationships between constructs, can test formative and reflective measures, and can deal with large models. SPSS AMOS does not calculate PLS. Therefore, SPSS was used to compute the PLS regression.

Sample Size

When conducting a factor analysis, researchers should gather as large of a data set as possible. Sample size is important in factor analysis and is related to the number of variables. The minimum number of observations varies in current literature from 5-20 per factor (Gorsuch, 1983; Lleras, 2005; Matsunaga, 2010; Olobatuyi, 2006; Stevens, 2002). In this study there were 12 variables requiring a minimum range of 60-240 observations. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy has a range from 0.0-1.0; with values approaching 1.0 indicating an appropriate sample size for the analysis. A minimum value of 0.6 will be required for factor analysis (Tabachnick & Fidell, 2001).

Bartlett's Chi-square Test

The chi-square test is one of statistical significance. The intent is to reject the null hypothesis. If the null is rejected, factors are extracted sequentially. After the first factor is extracted, the null hypothesis is tested again. This process continues until a residual correlation matrix equals an identity matrix, and no additional information remains.

Factor Analysis

Factor analysis is a group of methods used to examine how underlying constructs influence the responses on several measured items. Factor analyses are performed by determining the pattern of correlations (or covariance) between the observed items. Factor analysis can be exploratory, or confirmatory. Exploratory factor analysis (EFA) is used when a new model is being developed. EFA is often not purely exploratory as the researcher affects the analysis. EFA can be used to measure the validity of the instrument and can be confirmatory in nature (Alshare et al., 2009). Confirmatory factor analysis (CFA) provides a framework for confirming existing ideas around the structure of content. EFA and CFA are currently considered to be methods of structural equation modeling. When constructs are based upon strong theory and empirical base, a confirmatory factor analysis (CFA) can be utilized (Alshare et al., 2009; Pruzek, 2005). This study uses an Exploratory factor analysis.

Determining the Number of Factors

The number of factors extracted was determined using a set of guidelines. The guidelines used included a parallel analysis, percentage of variance, the screen test, and interpretability (Auerswald & Moshagen, 2019; Matsunaga, 2010; Sarwono, 2017; Stevens, 2002; Tabachnick & Fidell, 2001).

Parallel analysis is one of the most accurate factor retention strategies, as it accounts for sampling error. Sampling error is accounted for by comparing Eigenvalues from a correlation matrix of original data to that of randomly ordered variables of identical sample size. Eigenvalues generated from real data are aligned parallel to the Eigenvalues generated from randomly ordered 'fake' data. Randomly ordered scores create a correlation matrix approximating an identity matrix with Eigenvalues just above and below 1.0 due to sampling error (Auserwald & Moshagen, 2019; Sarwono, 2017; Stevens, 2002; Tabachnick & Fidell, 2001).

The graphical scree method plots Eigenvalues against the factor number and depicts the relative size of the Eigenvalues (Cattell, 1996). When the slope shifts to the horizontal portion of the distribution can be used as an indicator for the number of factors to extract. Retained components generally account for a large and distinct amount of variance (Auserwald & Moshagen, 2019; Cattell, 1996; Sarwono, 2017; Stevens, 2002; Tabachnick & Fidell, 2001).

The intention of rotation of the axis is to have interpretable results. There are two types of rotation, orthogonal and oblique. The orthogonal method is commonly used because the latent factors are not correlated with each other. Oblique rotations can be utilized when the factors are correlated with each other (Stevens, 2002). There are multiple types of orthogonal rotation methods, the Varimax method being the most common. The Varimax method typically identifies early factors with a smaller number of variables allowing more items to correlate with later factors (Auerswald & Moshagen, 2019; Lleras, 2005; Stevens, 2002). Varimax was used for the purposes of this study.

Items were grouped according to factors. Internal consistency reliability analysis was conducted on each factor and a Cronbach alpha determined. Cronbach's alpha indicates the degree to which items consistently measure a single factor (Creswell, 2003). For this study alpha values were set at ≥ 0.70, indicating a relatively high internal consistency (Creswell, 2003; Stevens, 2002; Tabachnick & Fidell, 2001).

Multicollinearity occurs when two or more predictors in the model are correlated and provide redundant information about the response. Multicollinearity test aims to determine whether there is correlation between independent variables in a regression model. Variance inflation factor is used to detect the presence of multicollinearity. VIF measures how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related.

According to Stevens (2009) variables with VIF > 10 indicated issues of multicollinearity and are to be avoided in a regression analysis. Variables with VIFs of 10 or higher will be removed. Generated VIF values <10 indicate that data does not have problems with multicollinearity and meets the requirements of multicollinearity testing.

Path analysis

The final step in the analysis is development of a structural model constructed through analyzing the path loadings between constructs. A path analysis aids researchers in understanding complex relationships and determine the most significant relationships. Path analysis models are based on correlations, graphically displaying the constructs of observed variables and indicate relationships between theoretical constructs (Alshare et al., 2009; Lleras, 2005; Olobatuyi, 2006; Sarwono, 2017; Stevens, 2002).

Modeling relationships between variables are determined by either covariance structure analysis (SEM) or partial least squares (PLS) modeling. The PLS method can successfully model constructs with small sample sizes and under conditions of non-normality. PLS can be used with complex models that focus on prediction (Compeau & Higgins, 1995; Chin & Gopal, 1995). Factor modeling (AMOS) tends to examine a model fit for which the researcher interprets the viability and inclusion of factors. Composite-based path modeling aims to investigate relationships among a set of constructs, that constitute a representation of theoretical constructs. Composite analysis requires more complicated latent variables based on several dimension. PLS has been implemented in several studies with smaller samples; including the Venkatesh et al. (2003) study with just over 100 participants (Jöreskog & Wold, 1982; Neufeld et al., 2007). Therefore, PLS was determined to be suitable for this study.

The first step is to test item reliabilities confirming they load on related factors. Unidimensionality indicates the factors measure the items they are intended to measure.

Loading for unidimensionality are measures of correlations between items and factors and should be ≥ 0.70 to ensure at least 50% of variance is accounted for. Path coefficients in a PLS model are regression coefficients (Chin, 1998; Chin, Marcolin, & Newsted, 2003; Neufeld et al., 2007).

Before building the path analysis from the structural model, model quality must be assessed. Individual item reliability will be determined using the criterion of coefficients ≥ 0.7 (Chin, Marcolin, & Newsted, 2003; Lleras, 2005; Matsunaga, 2010; Stevens, 2002). Next, the composite reliabilities of factors will be reviewed to ensure the occurrence of random error is minimized. Discriminate validity indicates the extent to which factors are unique and measure distinctly different concepts. Discriminate validity can be tested using average variance extracted (Chin, Marcolin, & Newsted, 2003; Matsunaga, 2010; Stevens, 2002).

After ensuring a reliable and valid model, investigation of independent factors can be conducted. As well as exploration of the size and significance of path coefficients (Beta weights). Values are indicative of the amount of variance in the dependent variable which explained by the independent variables of the model (Lleras, 2005; Matsunaga, 2010; Sarwono, 2017). The structural model will focus on the relationship between the factors and the dependent variable of behavioral intention. The strength of the relationship is based upon the beta value: ß < 0.2 is weak, ß between 0.2-0.5 exhibits a moderate effect, ß > 0.5 is a strong effect (Chin, Marcolin, & Newsted, 2003).

Thematic Analysis

Data derived from the open-ended questions included at the end of the online survey were analyzed using a theme-based approach. Thematic analyses are used in qualitative research methodologies and focus on examining patterns within a data set. Qualitative analyses can provide organization and an enriched description of the data, as well as a theoretically informed interpretation of meaning (Creswell, 2003; Creswell & Path, 2017; Nowell, L., Norris, J., White, D., & Moules, N., 2017). The investigator utilized an interpretative approach to the origination of data categories, deriving reported themes from participant provided questionnaire responses. Themes were identified, named, and analyzed regarding the frequency of occurrence. Additionally, an explanation of identified themes was provided.

Reported Statistics

Assumption Testing

Assumption testing included the total sample size, frequencies, and descriptive statistics. Additionally, the KMO value for sampling adequacy was reported. The KMO has a range of values from 0.0 to 1.0; values approaching 1.0 indicate an adequate sample size. The KMO will be followed by Bartlett's test of sphericity examining statistical significance and is reported as a chi square statistic x^2*(degrees of freedom, N=sample size) = chi-square statistic value, p=p value.* A communality estimate (h^2) for each variable, as well as the average communality for variables in the data set were reported. Communalities are used to estimate the amount of variance that is error free and shared with other variables in the matrix.

Determining the Number of Factors

Each iteration of factor analysis reporting includes a parallel analysis, percentage of variance, and scree test plot. Parallel analysis reporting includes Eigenvalues of the actual and simulated data for each factor. Percentage of variance reported for each factor includes Eigenvalue (%), explained variance (%), and cumulative variance (%). Scree test plot graphics, plot Eigenvalues against the factor number depicting the relative size of the Eigenvalues.

Factor Loadings

Final rotated factor loadings for each were reported along with the communality and factor structure coefficients (Pearson correlations) between the variables and each factor.

Reliability Analyses

Following presentation of the factor analysis results, reliability analyses were provided. Reporting of reliability analyses are combined with a descriptive table including names of factors, items in each factor, descriptive statistics for the composite scores, and the Cronbach's alpha which is a measure of internal reliability.

Path Analysis

Individual item reliabilities loadings should be greater than 0.7. A table presents the remaining item loadings and weights from the model. Additionally, statistics of latent factors are reported through the average variance extracted statistic, composite reliability, R^2, Cronbach's alpha, communality, and redundancy. As previously discussed, path coefficients in a PLS model are regression coefficients (beta weights) and the loading of items on the factors are the same as factor structure coefficients. These coefficients were applied directly to the model to convey the relationship between identifiable factors and the dependent variable. These relationships were measured by beta values and are also reported in a table outlining the path relationship, beta value, p value, and strength of the relationship.

Ethical Considerations

There are three overarching principles relevant to the ethics of research involving human subjects: respect of person, beneficence, and justice. Respect of person refers to the individuality of each person and their ability to make independent decisions. These individuals have the mental capacity to make choices and are not considered to be part of the protected population. The protected population includes children, prisoners, pregnant women, nonviable neonates, and neonates of uncertain viability. Beneficence refers to the obligation to protect participants from harm. And justice refers to the concept of equality among participants and the selection process. These principles must be considered and used in obtaining informed consent, as well as privacy and confidentiality (Campbell & Stanley, 1966; Fowler, 2014).

Participants were provided a description of the study and the possible risks involved with participation. Details regarding the survey data collection methods, response tracking, and data storage were outlined for participants. The survey included an option to allow the participant to withdraw from the survey. If this option was selected all responses from that participant were discarded. Participants were given the option to withdraw from the study at any time. Each survey item included a “I choose not to respond” option, as well as an option to discard or submit the data at the conclusion of the survey. These items addressed the principle of respect and provided the participants (human subjects) with crucial information about the study that is easily understood and provided multiple opportunities to opt out. A “Consent for Survey Item” was provided to all participants prior to administering survey content and after receiving IRB approval to proceed with data collection. The “Consent for Survey Item” included an “I agree” and “I do not agree" choice for participants to indicate whether they consented to study participation.

This study involved minimal risk to participants, as the harm/discomfort was not greater than that ordinarily encountered in activities of daily living and did not impact participant job performance or evaluation. Additionally, a study of perception does not directly manipulate behavior and does not involve stress to the participant.

Minimal identifiable data was collected (email address and consent form signature) and identifiers were removed and destroyed following data collection. Access to research data was based on a "need to know" and "minimum necessary" standard. Participants were informed about the confidentiality of their responses and the technology used to collect them. However, confidentiality was not guaranteed, online transmission security is not guaranteed.

Data collected through Qualtrics was stored on Qualtrics' servers until downloaded by the researcher. The downloaded data is stored on the researcher's home computer and a designated external drive for a minimum of three years following study completion, as well as, on a Boise State University computer on campus for three years. Once the designated time has passed the data will be deleted.

Limitation and Delimitations

This study's limitations include issues intrinsic to the use of online survey research. While the use of VAPE is applicable to multiple healthcare education fields, the sample will be limited to individuals who work with or teach for a CoAEMSP accredited EMS education program, whose contact information was available on the website, and completed the survey in its entirety. The time of survey administration may not have been convenient or conducive for full participation. Additionally, the current educational environment has been greatly influenced by social distancing requirements to reduce the spread of COVID-19. The push to online and hybrid learning environments may have biased participants. There is always a risk of dishonest responses. Social desirability bias is a concern in most social science research and consists of answers participants perceive as favorable by others. This bias interferes with the interpretation of average tendencies and individual differences.

Description of Dimensions

The characteristics of the research model were defined as follows: (1) attitude as the users' perception of the worth of VAPE and is measured by perceived usefulness and perceived ease of use. Perceived usefulness represents users' subjective beliefs about the benefits of using VAPE to aide students in learning applicable knowledge. Perceived ease of use represents the degree to which faculty and staff believe using VAPE is easy, (2) demographics and prior experience will explore the characteristics of study participants and their prior clinical and instructional experience, as well as, experience utilizing VAPE, (3) the user's ability to operate and incorporate educational technologies as technological competency, (4) social norms as the perceived opinions that compel individuals to exhibit specific behaviors, the influence of other people, (5) and personality as assessed by the FFM and reported as either extraversion, neuroticism, openness, agreeableness, or conscientiousness. The content of survey questions can be found in Appendix B.

Expected Results

The data collected with the survey represents the insights of EMS educators regarding factors that hypothetically affect their intention to integrate and possible use of VAPE in curriculum design. These factors are additional to those originally identified in the original TAM and TPB.

A response rate of 10-20% was predicted. Assuming an average of 3 faculty/staff at each accredited institution, the total possible sample size is 1,872. The predicted return rate would have resulted in a sample of 187-561 individuals. The total number of expected responses falls within the range of minimum required observations of 5-20 per factor for a total of 60-240 (Gorsuch, 1983; Lleras, 2005; Matsunaga, 2010; Olobatuyi, 2006; Stevens, 2002).

It was expected most participants would be male, aged 35-55 years, having completed a bachelor's degree, and working as an instructor for an Associate degree program. Additionally, it was predicted participants will have at least 3-5 years of prehospital clinical and teaching experience (Ruple et al., 2005b). It was predicted attitude (PU and PEOU), educator experience, prior use, social norms, and personality (specifically openness and extraversion) would demonstrate the strongest relationships with behavioral intention. Also, the structural model was expected to support a strong relationship between intention and actual use.

The purpose of this study is to investigate factors influencing educator behavioral intention to use VAPE in EMS education. This study contributes to behavioral intention research through confirmation of the proposed model and provision of a new context for an extended and adapted TAM. Understanding the relationships between factors and behavioral intention has important ramification for educational practice. It also provides an understanding of how individual EMS educators approach VAPE technology use. Educators themselves should be made aware of how their individual beliefs and behaviors impact usage of educational technology, specifically VAPE.

Supplementary information can be extracted from the study as to the need for VAPE and case-based learning, how VAPE are and maybe used in EMS education, as well as challenges to adoption and implementation.

Chapter 3 Summary

This study tested the proposed model and conceptual framework among prehospital EMS educators. The model consisted of the following constructs: perceived usefulness, perceived ease of use, social norms, personality, technological competency, and prior experience. The measured outcomes included behavioral intention of the user towards VAPE. The relationship between intention and behavioral use was measured, as well as the relationship between outcomes and sample demographics. For the purposes of this study, behavioral use was defined as the implementation of activities into the curriculum by the user which requires use of the technology.

PLS is a multivariate technique that hypothesizes relationships between variables and will be used to produce a path diagram. PLS was used in two steps of the model development process: factor analysis (development of the measurement model) and path analysis (development of the path diagram). The analysis plan indicates the strength of the relationships between the constructs and dependent variable.

Chapter Four contains the results of the analysis described in Chapter Three. Results of the EFA are presented for the survey items. A measurement and structural model produced by the partial least squares analysis is also presented in Chapter Four.

CHAPTER FOUR: RESULTS

The data provides insights to factors which may impact EMS educator's intention to integrate videos of authentic patient encounters (VAPE) within curriculum content. The conceptualized theory included several factors that could influence the Behavioral Intention (BI) of educators to integrate VAPE. The factors were originally identified as 1) Perceived Usefulness (PU), 2) Perceived Ease of Use (PEOU), 3) Social Norms, 4) Extraversion, 5) Neuroticism, 6) Agreeableness, 7) Openness, 8) Conscientiousness, 9) Technological Competency, 10) Provider Experience, 11) Educator Experience, and 12) Previous Use.

Chapter four presents results of the data analysis. The chapter begins with a synopsis of demographics to depict the study sample. Following the sample illustration, the chapter will outline analysis of the data to include the factor analysis process, partial least squares regression analysis, path analysis, and a thematic analysis of qualitative data portraying EMS educator perspectives on how VAPE can meet needs of educators, improve student learning, and challenges to adoption.

Sample

Study participants included academic professionals currently working with or teaching for an accredited prehospital EMS education program. This study encompassed a maximum of 12 factors requiring a minimum range of 60-240 observations. The survey was sent to a total of 1,293 potential participants. Of the 1,293 educators invited to participate, 148(11.4%) completed the survey. The total number of received responses falls within the expected response rate of 10-20%, as well as the minimum required observations of 60-240 (Gorsuch, 1983; Lleras, 2005; Matsunaga, 2010; Olobatuyi, 2006; Stevens, 2002). Of the 148 responses, 6 were removed for incomplete or missing data leaving 142(10.9%) individual responses for data analysis.

Demographics

The demographic profile of the participants is provided in Table 5. Most responses were from rural communities (38.7%) in the southern region (82.4%) of the United States. The sample was largely comprised of men (71.1%) with an average age of 48.9 years, whose strongest personality trait was conscientiousness (31%), held a baccalaureate degree (39.4%), and worked for an associate degree program (48.6%) as an instructor (52.1%). On average participants reported 23.6 years of experience as a clinical provider and 17.3 years of experience as an EMS Educator.

Table 5 Participant Demographics

Age—mean (±SD), years	48.9 (±11.04)
Gender—n(%)	
Male	101 (71.1%)
Female	41 (28.9%)
EMS clinical experience— mean (±SD), years	23.6 (±9.9)
EMS educator experience— mean (±SD), years	17.3 (±9.8)
Extraversion— mean (±SD), score	34.9 (±6.6)
Agreeableness— mean (±SD), score	38.8 (±4.1)
Conscientiousness— mean (±SD), score	38.4 (±4.2)
Emotional Stability— mean (±SD), score	29.9 (±3.7)
Intellect— mean (±SD), score	36.5 (±2.9)
*Main Personality Characteristic	
Extraversion—n(%)	28 (19.7%)
Agreeableness—n(%)	42 (29.6%)
Conscientiousness—n(%)	44 (31.0%)
Intellect—n(%)	15 (10.6%)
Tie—n(%)	13 (9.2%)

*Main personality characteristic was recorded as the characteristic with the highest score. There were 13 participants who had two or more characteristics which had equivalent scores. These data points were recorded as “Tie.” SD=standard deviation.

Exploratory Factor Analysis I (EFA-I)

A critical and top priority stage of the analysis is determining the number of factors. Factor analysis is used to identify underlying constructs which explain variations in measurement by reducing observable items into a smaller number of unobserved latent factors. Factor analysis is recommended when the constructs have been well tested, are based on robust theory, and have a solid empirical foundation. This study was based on well-established fields of study and validated instruments. The survey items were designed to measure specific constructs which were previously devised and established. Factor analysis can be used to confirm the latent factor structure for a group of measured variables, as it accounts for a group of measured variables, latent factors, and error (O'rourke, Hatcher, and Stepanski, 2005).

Of the 76-item survey, factor analysis was performed on 66 items to determine the number of constructs and remove inconsequential items. Demographic and qualitative questions were not included in the factor analysis.

Assumption Testing

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy has a range of 0.0-1.0; values approaching 1.0 indicate an adequate sample size for factor analysis. A minimum value of 0.6 is required for factor analysis (Tabachinkick & Fidell, 2001). The KMO value in EFA-I was 0.620, which indicates the results are suitable for factor analysis (Appendix C).

Bartlett's test of sphericity converts the determinant to a chi square statistic and tests for statistical significance. In this study, the matrix did not derive from a population in which the inter-correlation matrix ($p<0.001$) is an identity matrix and is subsequently factorable (Appendix C).

Factor analysis begins with deriving a communality estimate (h^2) for each variable. This step estimates the amount of variance of an item which is error free and shared with other items in the matrix. The communality for a given variable is the proportion of variation in that variable explained by the factors. Communalities should be less than 1.0; if the communality exceeds 1.0 the solution may indicate a small sample size, or the study has too many/few factors. Communalities should be above 0.5 (field, 2005). For EFA-I all communalities were above 0.5, indicating ≥50% of the variance in the variables was accounted for (Appendix C).

Determining the Number of Factors

Parallel analysis is one of many approaches to determine the number of factors and is based on random data simulation. An artificial data set is generated alongside actual (real) data and the estimated Eigenvalues are calculated. The Eigenvalues represent the amount of variance associated with each component identified in the factor analysis. When the Eigenvalues from the generated data are larger than the Eigenvalues from the factor analysis, those components/factors are comprised of random noise and should be removed from the analysis. A comparison of the Eigenvalues for the first 10 components can be found in Table 7. The parallel analysis indicated the inclusion of 8 components/factors.

Table 7 EFA-I Parallel Analysis

	Eigenvalue of the actual data	Eigenvalue of the simulated data
1	7.604	2.676
2	5.580	2.518
3	4.412	2.397
4	3.620	2.303
5	3.429	2.211
6	3.187	2.122
7	2.400	2.042
8	2.198	1.978
9	**1.813**	**1.916**
10	1.797	1.850

An index of goodness of fit in multivariate data analysis is the percentage of explained variance: the higher the percentage of variance a model manages to explain, the more valid the model. The EFA-I extracted 18 components accounting for 70.3% of the variance across all 66 components (Appendix C).

The scree plot is a graphical test based on Eigenvalues. The vertical axis represents Eigenvalues, and the horizontal axis represents factors/components. A line connects the plotted Eigenvalues. Sequentially extracted factors have continuously smaller Eigenvalues creating a downward slope. Factors with Eigenvalues above the straight line and to the left are retained. Factors with Eigenvalues on or near the straight line are discarded. The scree plot displayed in Figure 10 shows a significant drop and plateau in slope beginning at approximately the eighth component. Each successive component following the change in slope, accounts for a smaller percentage of the total variance.

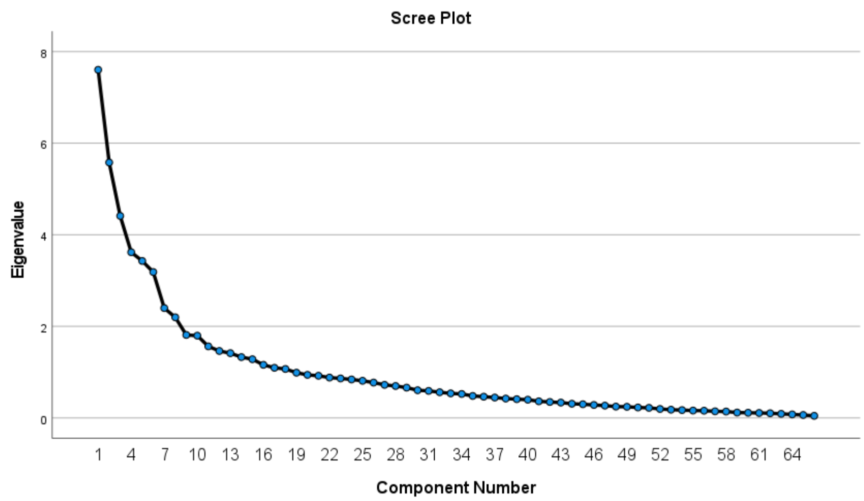


Figure 10 EFA-I Scree Plot

It is important to retain the number of factors that will account for approximately 50% of the total variance. If too much of the variance is retained, it can lead to the problematic retention of factors. The parallel analysis and scree plot for EFA-I support extracting 8 factors. The 8 factors identified have Eigenvalues above 1.0, representing 49.1% of the variance. The factors were limited to a total of 8 and the analysis was completed again.

Exploratory Factor Analysis II (EFA-II)

Assumption Testing

Because EFA-I was utilized to determine the number of factors and items were not removed from the analysis, there were no changes to the values in the KMO and Bartlett's test of sphericity. The KMO value in EFA-I was 0.62, which indicates the results are suitable for factor analysis. The matrix did not derive from a population in which the inter-correlation matrix ($p<0.001$) is an identity matrix and is subsequently factorable (Appendix D).

For EFA-II not all communalities were above 0.5. Table 7 identifies items with a communality below 0.5. The remaining items had communalities above 0.5, indicating ≥50% of the variance in the variables was accounted for.

Table 7 EFA-II Low Communalities

Survey Item	Communality
TechInteraction	0.444
TechTraining	0.440
Streaming	0.371
Extraversion_1	0.481
Extraversion_3	0.392
Extraversion_8	0.386
Agreeableness_1	0.186
Agreeableness_2	0.447
Agreeableness_3	0.451
Agreeableness_5	0.187
Agreeableness_6	0.487
Agreeableness_7	0.488
Agreeableness_8	0.470
Conscientiousness_1	0.343
Conscientiousness_3	0.395
Conscientiousness_4	0.441
Conscientiousness_6	0.364
Conscientiousness_8	0.361
Conscientiousness_9	0.446
Stability_4	0.394

Survey Item	Communality
Stability_5	0.448
Stability_7	0.474
Stability_8	0.499
Intellect_1	0.428
Intellect_3	0.443
Intellect_4	0.428
Intellect_5	0.357
Intellect_6	0.252
Intellect_7	0.417

Determining the Number of Factors

Because EFA-I was utilized to determine the number of factors and items were not removed from the analysis, there were no changes to the values in the parallel analysis and Scree plot. The parallel analysis indicated the inclusion of 8 components/factors.

The Eigenvalues in Appendix D represent the amount of variance associated with each component identified in the factor analysis. The EFA-II extracted 8 components accounting for 49.1% of the variance across all 66 components.

The rotated component matrix (Appendix D) shows which items load on specific components after rotation. This provides a clear depiction of the components. The original factor analysis matrix has multiple solutions if the reference axes are rotated. The intention of rotation of the axis is to provide a more interpretable solution. The varimax orthogonal rotation is commonly used because the early factors are generally identified by a smaller set of variables allowing more items to correlate with later factors.

Stability_2, Stability_4, Intellect_2, Extraversion_5, Extraversion_7, Extraversion_9, Extraversion_3, Intellect_6, Intellect_4, Agreeableness_7, Agreeableness_ 5, Agreeableness_1, Conscientiousness_2, ReelDXUse, Intellect_3, and Consicientiousness_6 failed to load on any factor (Appendix D). Items which failed to load on a factor were removed. The parallel analysis and scree plot support the inclusion of 8 factors. Factors were set at 8, the items listed above were removed, and the analysis was completed on the remaining components.

Exploratory Factor Analysis III

Assumption Testing

EFA-II identified 16 items that were removed, and the analysis was repeated. The KMO value in EFA-III was 0.666, which indicates the results are suitable for factor analysis. The matrix did not derive from a population in which the inter-correlation matrix ($p<0.001$) is an identity matrix and is subsequently factorable (Appendix E).

For EFA-II not all communalities were above 0.5. Table 9 identifies items with a communality below 0.5. The remaining items had communalities above 0.5, indicating ≥50% of the variance in the variables was accounted for.

Table 9 EFA-III Low Communalities

Survey Item	**Communality**
Extraversion_1	0.438
Extraversion_8	0.458
Agreeableness_2	0.460
Agreeableness_3	0.375
Conscientiousness_1	0.377
Conscientiousness_3	0.375
Conscientiousness_4	0.494
Stability_5	0.426
Intellect_1	0.459
Intellect_5	0.391
Intellect_7	0.441
Intellect_9	0.174

Determining the Number of Factors

The parallel analysis indicates the inclusion of 7 components/factors (Appendix E). The scree plot in EFA-III (Figure 11) remains relatively unchanged from those produced in earlier iterations. At approximately the 7^{th} component there is a significant change and plateau in the slop representing a decrease in the percentage of variance accounted for.

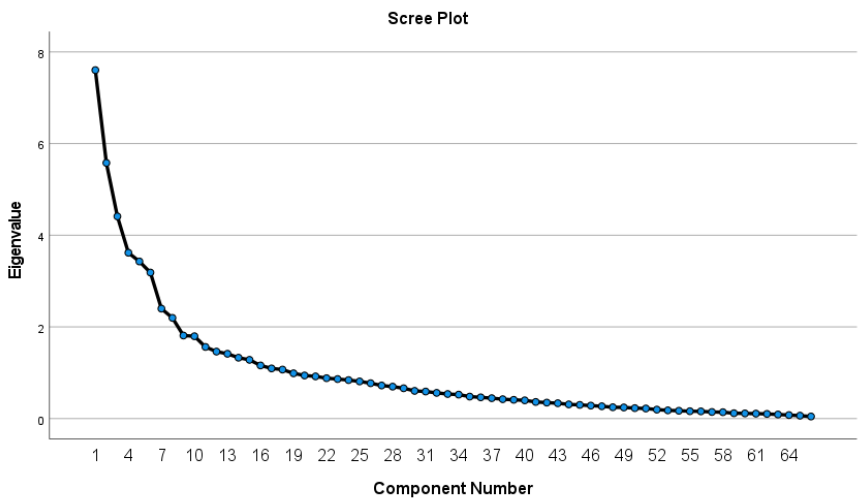


Figure 11 EFA-III Scree Plot

The EFA-III extracted 8 components accounting for 54.860% of the variance across all remaining 50 components (Appendix E).

The rotated component matrix shows which items load on which components after rotation (Appendix E). Component 1 consists of PEOU_3, PU_3, PU_2, PU_1, PU_4, PEOU_1, PEOU_4, PeerUseOp, PeerVideoOp, PEOU_2. Component 2 consists of Stability_6, Stability_10, Stability_9, Stability_7, Stability_3, Stability_1, Stability_8, Stability_5. Component 3 consists of Extraversion_10, Extraversion_4, Extraversion_2, Extraversion_6, Extraversion_8. Component 4 consists of Agreeableness_9, Agreeableness_6, Agreeableness_4, Agreeablness_10, Agreeableness_8, Agreeableness_2. Component 5 consists of Conscientiousness_5, Conscientiousness_9, Conscientiousness_7, Conscientiousness_10, Conscientiousness_1, Conscientiousness_3. Components 6 consists of Intellect_8, Intellect_1, TechInteraction, TechTraining, Intellect_5, Intellect_10, Streaming. Component 7 consists of TeachingTime, ProviderTime, Intellect_7. Component 8 consists of Conscientiousness_8, Agreeablness_3, Conscientiousness_4. Extraversion_1 and Intellect_9 failed to load on any factor (Appendix E).

There were 7 items which loaded on component 6, four of which were related to personality characteristic Intellect and the others to Technological Competency (Appendix E). Based on the frequency (Table 6) which participants were identified as having Intellect as their strongest personality characteristic (n=15, 10.6%), it is unlikely these items are significant. Intellect_8, Intellect_1, Intellect_5, and Intellect_10 should be removed. Component 8 consists of 3 items from 2 separate personality characteristics Conscientiousness_8, Agreeablness_3, and Conscientiousness_4. Since conscientiousness is represented in Component 5 and Agreeableness is unrelated these items should be removed. Finally, items which failed to load on a factor (Extraversion_1 and Intellect_9) should be removed.

Removal of the items which loaded on Component eight and items which failed to load on a factor, along with identification of 7 components from the parallel analysis support further component reduction. The 7 identified components have Eigenvalues above 1.0, representing 51.492% of the variance.

Exploratory Factor Analysis IV

Assumption Testing

EFA-III identified inclusion of 7 components. In addition to the reduction in components, 9 items were removed, and the analysis was repeated. The KMO value in EFA-IV was 0.723, which indicates the results are suitable for factor analysis. The matrix did not derive from a population in which the inter-correlation matrix ($p<0.001$) is an identity matrix and is subsequently factorable (Appendix F). KMO and Bartlett's test, indicate the results are suitable for factor analysis.

For EFA-IV not all communalities were above 0.5. Table 10 identifies items with a communality below 0.5. The remaining items had communalities above 0.5, indicating the items accounted for ≥50% of the variance in the variables.

Table 10 EFA-IV Low Communalities

Survey Item	**Communality**
Stability_5	0.419
Stability_8	0.462
Conscientiousness_1	0.407
Conscientiousness_3	0.365
Conscientiousness_9	0.481
Conscientiousness_10	0.477
Extraversion_8	0.429
Agreeableness_2	0.412
Intellect_7	0.380

Determining the Number of Factors

The parallel analysis indicates the inclusion of 7 components/factors (Appendix F). The scree plot in EFA-III (Figure 12) remains relatively unchanged from those produced in earlier iterations. At approximately the 7th component there is a significant change and plateau in the slope, representing a decrease in the amount(?) of accountable variance.

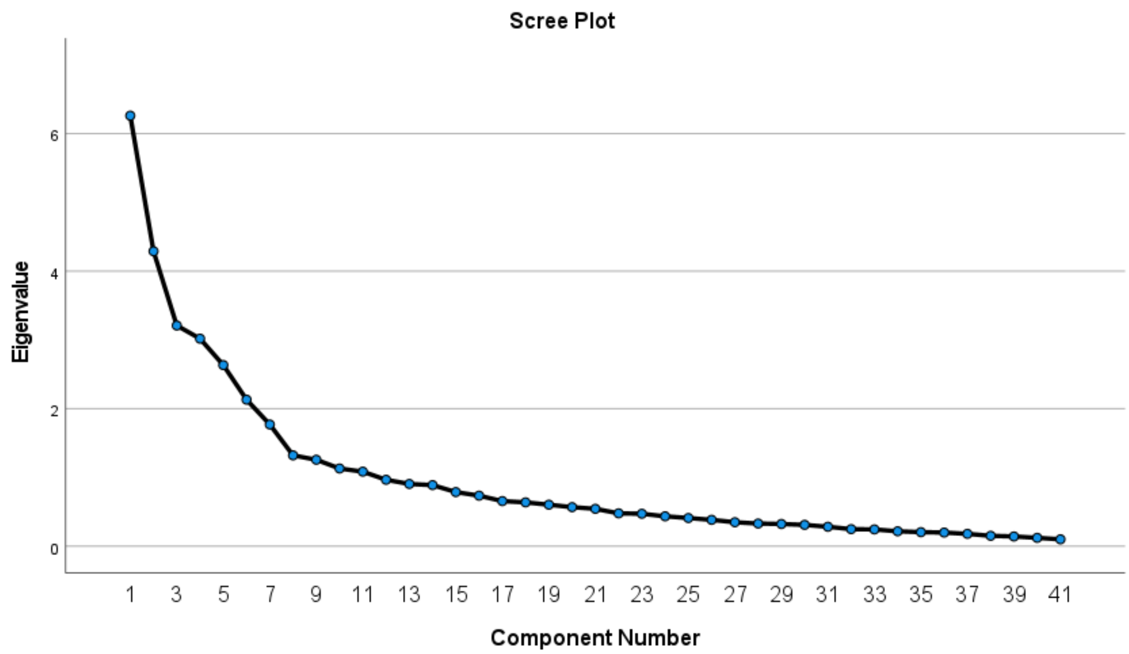


Figure 12 EFA-IV Scree Plot

The EFA-IV extracted 7 components accounting for 56.874% of the variance across all 41 components (Appendix F).

The rotated component matrix (Appendix F) shows which items load on which components after rotation. Component 1 consists of PU_1, PU_2, PU_3, PU_4, PEOU_1, PEOU_2, PEOU_3, PEOU_4, PeerVideoOp, and PeerUseOp. Component 2 consists of Stability_1, Stability_3, Stability_5, Stability_6, Stability_7, Stability_8, Stability_9, and Stability_10. Component 3 consists of Agreeableness_2, Agreeableness_4, Agreeableness_6, Agreeableness_8, Agreeableness_9, and Agreeableness_10. Component 4 consists of Extraversion_2, Extraversion_4, Extraversion_6, Extraversion_8, and Extraversion_10. Component 5 consists of Conscientiousness_1, Conscientiousness_3, Conscientiousness_5, Conscientiousness_7, Conscientiousness_9, and Conscientiousness_10. Component 6 consists of ProviderTime, TeachingTime, and Intellect_7. Component 7 consists of TechInteraction, TechTraining, and Streaming.

Intellect_7 is unrelated to the other items in Component_6 and should be removed and the analysis completed again. The Parallel Analysis, item loadings from the Rotated Component Matrix, and Scree plot support the continued inclusion of 7 components.

Exploratory Factor Analysis V

Assumption Testing

EFA-IV identified inclusion of 7 components, as well as 1 item that was removed from analysis. The KMO value in EFA-V was 0.731, which indicates the results are suitable for factor analysis. The matrix did not derive from a population in which the inter-correlation matrix ($p<0.001$) is an identity matrix and is subsequently factorable (Appendix G).

For EFA-V not all communalities were above 0.5. Table 11 identifies items with a communality below 0.5. The remaining items had communalities above 0.5, indicating ≥50% of the variance in the variables was accounted for.

Table 11 EFA-V Low Communalities

Survey Item	Communality
Stability_5	0.414
Stability_7	0.496
Stability_8	0.460
Conscientiousness_1	0.411
Conscientiousness_3	0.335
Conscientiousness_9	0.481
Conscientiousness_10	0.471
Extraversion_8	0.427
Agreeableness_2	0.414
Agreeableness_10	0.487

Determining the Number of Factors

The parallel analysis indicates the inclusion of 7 components/factors (Appendix G). The scree plot in EFA-III (Figure 13) remains relatively unchanged from those produced in earlier iterations. At approximately the 7th component there is a significant change and plateau in the slop representing a decrease in the percentage of explained variance.

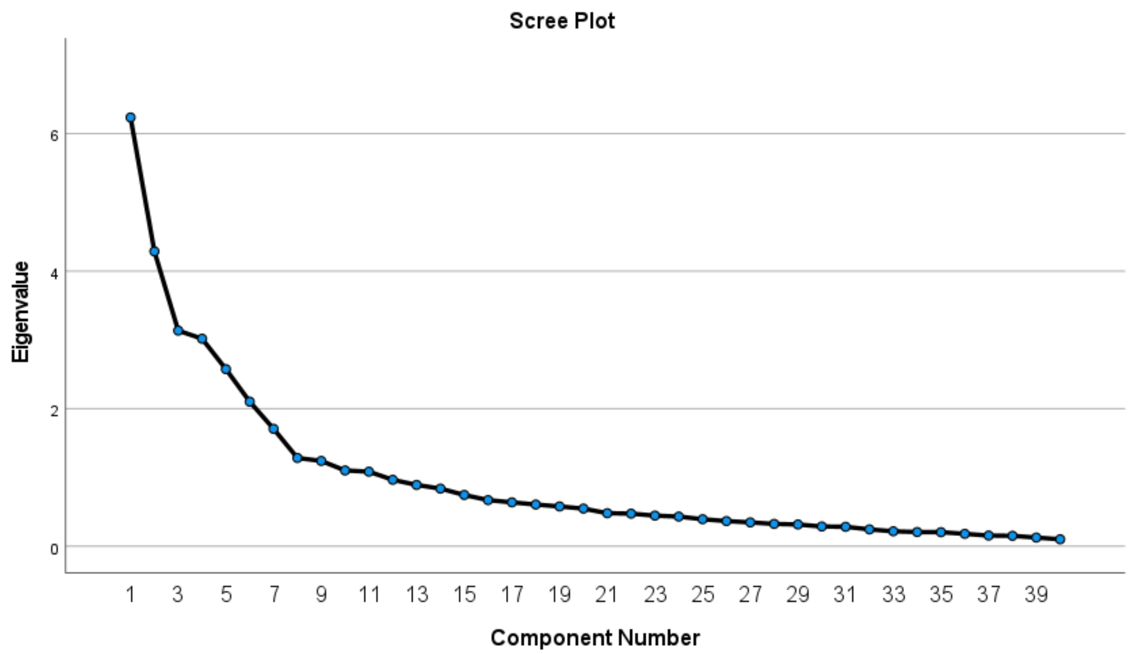


Figure 13 EFA-V Scree Plot

The EFA-V extracted 7 components accounting for 57.662% of the variance across all remaining 40 components. The rotated component matrix shows which items load on which components after rotation (Appendix G). Component 1 consists of PU_1, PU_2, PU_3, PU_4, PEOU_1, PEOU_2, PEOU_3, PEOU_4, PeerVideoOp, and PeerUseOp. Component 2 consists of Stability_1, Stability_3, Stability_5, Stability_6, Stability_7, Stability_8, Stability_9, and Stability_10. Component 3 consists of Agreeableness_2, Agreeableness_4, Agreeableness_6, Agreeableness_8, Agreeableness_9, and Agreeableness_10. Component 4 consists of Extraversion_2, Extraversion_4, Extraversion_6, Extraversion_8, and Extraversion_10. Component 5 consists of Conscientiousness_1, Conscientiousness_3, Conscientiousness_5, Conscientiousness_7, Conscientiousness_9, and Conscientiousness_10. Component 6 consists of TechInteraction, TechTraining, and Streaming. Component 7 consists of TeachingTime and ProviderTime.

A final analysis was completed with the removal of one additional item discussed in EFA-IV. EFA-V utilized the remaining 40 items to produce the 7 factors suggested in previous factor analysis iterations. The results of EFA-V indicate a stronger model with >50% of the variance accounted for and all items loading on the included components. Components were re-labeled to align with original theoretical model constructs and item content and are outlined in Table 12.

Table 12 Labels Associated with the Factor structure of EFA-V

Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
PU 10 items	ST 8 items	AG 6 items	EX 5 items	CO 6 items	TC 3 items	PE 2 items

Note: PU=Perceptions of Utility, ST=Stability, AG=Agreeableness, EX=Extraversion, CO=Conscientiousness, TC=Technological Competency, PE=Prior Experience

Internal Consistency Reliability

Internal consistency reliability is used to test reliability amongst items. Items were grouped according to factors; an internal consistency reliability analysis was conducted, and a Cronbach's alpha determined. Cronbach's alpha indicates the degree to which a set of items consistently measure an individual latent construct (Creswell, 2003). For this study alpha values were set at ≥0.70, indicating a relatively high internal consistency (Creswell, 2003; Stevens, 2002; Tabachnick & Fidell, 2001). Cronbach alpha values of the identified factors are listed in Table 13. The alpha values were above 0.70, indicating relatively high internal consistency.

Table 13 Reliability of Research Data

Factor	Number of Items	Cronbach’s Alpha
Factor 1: PU	10	0.908
Factor 2: ST	8	0.834
Factor 3: AG	6	0.786
Factor 4: EX	5	0.801
Factor 5: CO	6	0.725
Factor 6: TC	3	0.737
Factor 7: PE	2	0.754

Multicollinearity

The intercorrelation between explanatory variables is termed as ‘multicollinearity.’ Multicollinearity occurs when two or more predictors in the model are correlated and provide redundant information about the response. Variance inflation factor (VIF) is used to detect the presence of multicollinearity. VIF measures how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related.

According to Stevens (2002), variables with VIF > 10 indicated issues of multicollinearity and are to be avoided in a regression analysis. Items with VIFs of 10 or higher will be removed. Generated VIF values <10 indicate that the data do not have problems with multicollinearity and meets the requirements of multicollinearity testing. Table 14 delineates VIF values for all included items. VIF values for each item within all components were <10, indicating a lack of multicollinearity. No additional items were removed.

Table 14 VIF

Factor	Item	VIF
Factor 1: PU	PU_1	3.367
	PU_2	4.035
	PU_3	2.849
	PU_4	2.292
	PEOU_1	1.843
	PEOU_2	2.314
	PEOU_3	3.349
	PEOU_4	2.570
	PeerVideoOp	2.890
	PeerUseOp	2.867
Factor 2: ST	Stability_1	1.556
	Stability_3	1.620
	Stability_5	1.406
	Stability_6	1.889
	Stability_7	1.727
	Stability_8	1.645
	Stability_9	1.632
	Stability_10	1.786
Factor 3: AG	Agreeableness_2	1.395
	Agreeableness_4	1.649

Factor	Item	VIF
	Agreeableness_6	1.542
	Agreeableness_8	1.394
	Agreeableness_9	2.075
	Agreeableness_10	1.501
Factor 4: EX	Extraversion_2	1.699
	Extraversion_4	1.658
	Extraversion_6	1.675
	Extraversion_8	1.320
	Extraversion_10	1.652
Factor 5: CO	Conscientiousness_1	1.297
	Conscientiousness_3	1.188
	Concientiousness_5	1.477
	Conscientiousness_7	1.494
	Conscientiouness_9	1.520
	Conscientiousness_10	1.445
Factor 6: TC	TechInteraction	1.498
	TechTraining	1.715
	Streaming	1.380
Factor 7: PE	TeachingTime	2.322
	ProviderTime	2.322

Path Analysis

The final step in the analysis is the development of a structural model created through analyzing the path loadings between constructs. A path analysis examines relationships among measured factors. Partial least squares (PLS) regression is a modeling approach to structural equation modeling with no assumptions about data distribution. PLS is an appropriate approach in instances of 1) small sample size, 2) applications have little available theory, 3) missing values, 4) predictive accuracy is important, 5) multi-collinearity, and 6) correct model specification cannot be ensured. PLS models both theoretical relationships between latent factors (structural paths) and relationships between latent factors and their indicators (measurement paths). Latent factors cannot be directly measured. Indicators for latent factors are the survey items included from the factor analysis.

Individual item reliabilities confirm the survey items load on the related components. Unidimensionality indicates the related items of the components measure the intended latent factor. Standardized measurements for unidimensionality are correlations of the measure items with the respective factor. Loadings should be greater than 0.70, ensuring ≥50% of the variance is accounted for. Examining the loadings for each of the constructs, 7 of the items in factor 1, 1 item in factor 2, 2 items in factor 3, 1 item in factor 4, 2 items in factor 5, and 3 items in factor 6 had loadings of ≥ 0.70 (Appendix H). The relationship between the constructs of intent and use were not tested in the factor analysis. These constructs were included in the measurement model to complete the path analysis. The item loadings for intent and use were 1.0.

Cronbach's alpha is an average measure of internal consistency and item reliability. Cronbach's alpha scores for each Factor are outlined in Table 15. Cronbach's alpha may over- or underestimate scale reliability. Therefore, composite reliability is preferred in both confirmatory factor analysis and partial least squares regression (PLS) based research. Composite reliability is a measure of the overall internal consistency for scale items. Composite reliabilities of latent factors were reviewed to ensure the minimization of random error occurrence. Composite reliabilities of 6 factors were greater than 0.70. *The composite reliability of Factor 7: Prior Experience was 0.000* (Table 15). Composite reliability offers evidence the items used are internally consistent.

R Squared (R^2) indicates the amount of shared variation between two or more variables or their co-variance. The R^2 value will increase as you add more PLS factors because it measures the strength of the least-squares fit. The value gets closer and closer to 1.0 as more factors are incorporated.

Discriminate validity indicates the extent to which latent factors are distinct and measure separate individual concepts. Average Variance Extracted (AVE) is a measure of discriminate validity, it is the amount of variance captured by a construct in relation to the amount of variance due to measurement error. For adequate, an AVE of at least 0.50 is recommended. An AVE of less than 0.50 demonstrate items that explain more errors than the variance in factors. *Factor 1: Perceptions of Utility (0.561) and Factor 6: Technological Competency (0.658) had an AVE >0.50* (Table 15).

Table 15 PLS Statistics of Latent Factors

	AVE	Composite Reliability	R^2	Cronbach's Alpha
Factor 1: PU	0.561	0.927	0.316	0.912
Factor 2: ST	0.308	0.750	0.394	0.838
Factor 3: AG	0.482	0.847	0.443	0.788
Factor 4: EX	0.469	0.811	0.455	0.803
Factor 5: CO	0.364	0.750	0.463	0.724
Factor 6: TC	0.658	0.852	0.463	0.741
Factor 7: PE	0.123	0.000	0.461	0.860

Path coefficients in a PLS model are analogous to standardized regression coefficients (ß weights), and the loading of items on the factors are the factor structure coefficients. T statistics measure how many standard errors the coefficient is away from zero. Any T-value greater than +2 or less than -2 are acceptable. The higher the T-value, the greater confidence the coefficient is a predictor, the greater the evidence against the null hypothesis. Low T-values are indications of low reliability of the predictive power of a coefficient. Table 16 outlines ß weights, SD, T Statistics, and p values for each Factor.

Table 16 ß Weights

	ß Weight	SD	T Statistics	p value
Factor 1: PU	0.524	0.080	6.582	0.000
Factor 2: ST	0.146	0.177	0.823	0.411
Factor 3: AG	0.150	0.067	2.229	0.026
Factor 4: EX	-0.066	0.102	0.644	0.520
Factor 5: CO	0.224	0.118	1.895	0.059
Factor 6: TC	0.023	0.072	0.315	0.753
Factor 7: PE	-0.053	0.071	0.747	0.455
Intent→ Use	0.412	0.054	7.691	0.000

Path Analysis Interpretation

There are numerous guidelines for interpretation of a path analysis. There should be at least three items per latent factor. For this data, Factor 7: Prior Experience has two items. The items in Factor 1: Perceptions of Utility (0.561) and Factor 6: Technological Competency (0.658) had an AVE >0.50 (Table 14). Path loadings should be >.50. This was found once in the constructs of Factor 1: Perceptions of Utility (0.52). Individual item reliability was acceptable for all items which clustered to for the latent variables (Factor 1-7). The amount of variance explained by factors in the model is as follows:

Factor 1: PU (TAM Model) as related to Intention to Use = 27.5% (R^2=0.275)

Factor 2: ST (FFM) as related to Intention to Use = 2.1% (R^2=0.021)

Factor 3: AG (FFM) as related to Intention to Use = 2.3 % (R^2=0.023)

Factor 4: EX (FFM) as related to Intention to Use = 0.4% (R^2=0.004)

Factor 5: CO (FFM) as related to Intention to Use = 5% (R^2=0.050)

Factor 6: TC as related to Intention to Use = 0.05% (R^2=0.0005)

Factor 7: PE as related to Intention to Use = 0.3% (R^2=0.003)

Intention to Use as related to Use = 17% (R^2=0.170)

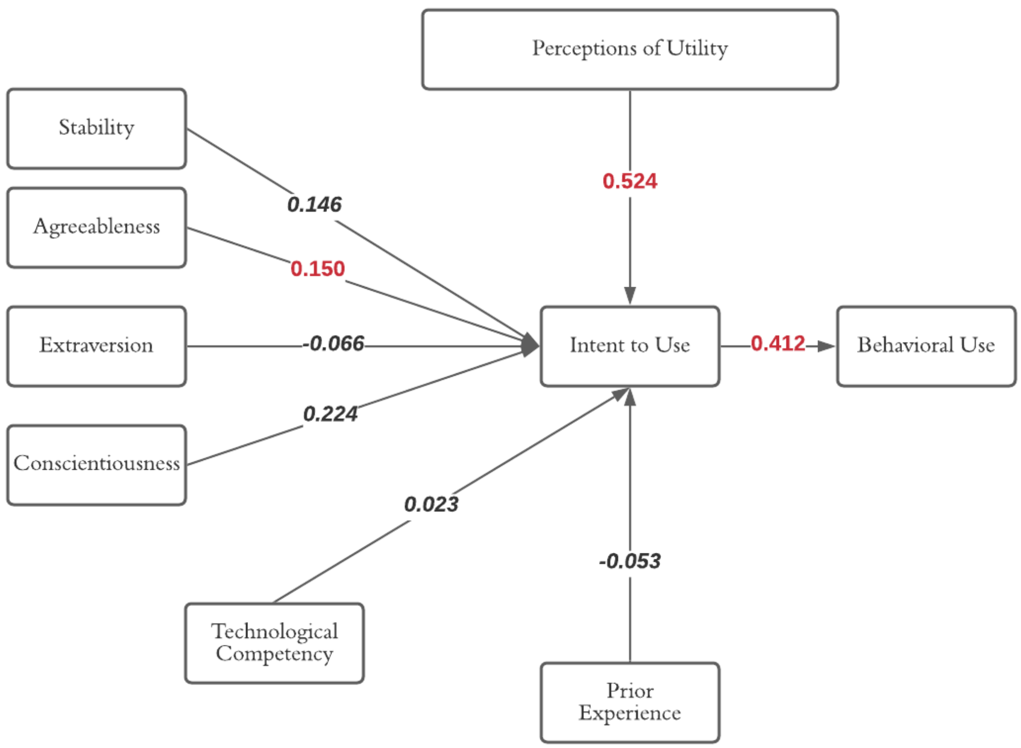


Figure 14 Path Diagram

Composite reliability for Factors 1-6 were acceptable with scores above 0.7 for, Factor 7: Prior Experience had a reliability score of 0.00. Convergent validity for Factors 1-6 were also acceptable with scores more than 0.3. Factor 7 had an AVE of 0.123. Path weights for items were above 0.7 except for Stability_8 (0.014) and ProviderTime (-0.399). The hypotheses originating from the TAM model were supported in the PLS analysis of this study.

The Structural Model

The structural model is fixed on ascertaining relationships between identifiable constructs and the dependent variable of Intent to Use, as well as, between Intent to Use and actual Use. These relationships were measured by beta values. The strength of these relationships is based upon the following groupings: ß=<0.2 is weak, ß=0.2-0.5 is moderate, and ß=>0.5 is strong effect (Chin et al., 2003, Cohen, 1992).

Table 17 Path Relationships

Path Relationship	ß	p	Strength
Factor 1: Perceptions of Utility → Intent to Use	0.524	0.000	Strong
Factor 2: Stability → Intent to Use	0.146	0.411	Weak
Factor 3: Agreeableness → Intent to Use	0.150	0.026	Weak
Factor 4: Extraversion → Intent to Use	-0.066	0.520	Weak
Factor 5: Conscientiousness → Intent to Use	0.224	0.059	Moderate
Factor 6: Technological Competency → Intent to Use	0.023	0.753	Weak
Factor 7: Prior Experience → Intent to Use	-0.053	0.455	Weak
Intent to Use → Use	0.412	0.000	Moderate

Qualitative Analysis

Thematic analysis identifies patterns with data, allowing for a detailed understanding. It looks for patterns from participant communication that is unrestrained by limitation to responses. Therefore, it is a valuable method for examining the content of responses collected from open-ended survey questions (Creswell, 2003; Creswell & Path, 2017; Nowell et al., 2017).

Qualitative data was collected on three survey items 1) [Educational Needs]: In what ways can videos of Authentic patient encounters recorded in clinical settings serve your educational needs? 2) [Improved Learning]: Do you think videos of Authentic patient encounters recorded in clinical settings can help students learn EMS content? Why? 3) [Adoption Challenges]: What are the challenges you face in adoption and use of applications such as ReelDX? These open-ended questions provided a method to gain a perspective of the participants insights, using their own words, regarding VAPE.

The collected item responses were read and re-read several times to ensure content understanding and accuracy of thematic categorization. Data which was meaningful to the study was indicated, recurring ideas were identified, and codes generated in the form of themed topics to represent significant data. For this study the coding was implemented by hand. For each qualitative survey item thematic categories were identified. These categories ascertained features of the data the researcher considered pertinent to the question and was repeatedly present in the responses. The themed categories were important phrases highlighting participant ideas, such as the following responses to Question 1 (Table 18):

Table 18 Example of Thematic Categorization

Participant Responses	Themed Category
"They could give real examples of disease of incident progression."	Real world examples/Unusual pathologies
"Particularly with COVID, such videos can provide a unique learning perspective for students when clinical rotations might otherwise not be available."	Clinical Substitute

The themes constituting these main ideas were reviewed to ensure they encompassed phrases of importance, were appropriate, and comprehensive in describing the data. Themes were identified from the responses to all questions and compiled for reporting.

Of the 142 participants 81 (57.04%) responded to the prompt on educational needs, 73 (53.5%) responded to the prompt on improved learning, and 68 (47.89%) to the prompt on adoption challenges.

Analysis of the educational needs prompt identified five thematic categories: use as a substitute for live clinical interaction (3, 3.7%), use as an adjunctive tool for teaching and demonstrating psychomotor skills (33, 40.7%), use as an adjunctive tool for didactic and simulation education (14, 17.3%), use as an instrument to stimulate critical thinking (15, 18.5%), and as a means of presenting 'real world' applicable examples and unusual patient pathologies (59, 72.8%).

A total of 67 (88.15%) respondents agreed VAPE can improve student learning. Analysis of the improved learning prompt identified five thematic categories: use as a visual/audio learning tool (11, 14.47%), use as a tool for cognitive assessment (2, 2.63%), an adjunct to simulation education (5, 6.58%), an instrument to demonstrate pathology (22, 28.95%), and a medium to showcase clinical skills (31, 40.79%).

Analysis of the adoption challenges prompt identified seven thematic categories: cost (37, 54.41%%), patient confidentiality/HIPAA (7, 10.29%), formatting of VAPE content (7, 10.29%), constraints on instructor time (12, 17.65%), the technological competency of instructors and available infrastructure (14, 20.59%), declination by higher administration (6, 8.82%), and issues related to internet access/bandwidth (7, 10.29%).

Summary

Chapter four presented the results and findings(?) of data analysis. EFA-I identified 8 components/factors via interpretation of parallel analysis and the scree plot. Factors were set at 8 and the analysis was completed again. EFA-II then identified 16 items which failed to load on any factor. These items were eliminated, and the analysis was completed again. The third iteration identified inclusion of 7 components through parallel analysis, which was confirmed with the scree plot. Several items were eliminated in EFA-III including, two items which failed to load on any component, four items related to personality characteristic Intellect, and three redundant and unrelated items in component 8. A total of 9 items were removed in EFA-III. A fourth iteration was completed (EFA-IV). EFA-IV identified 7 components and the removal of one additional item unrelated to the other items in component 6. A final iteration was completed (EFA-V), selecting 7 factors to arrive at the strongest model. The final factors included

Perceptions of Utility, Stability, Agreeableness, Extraversion, Conscientiousness, Technological Competency, and Prior Experience.

A path analysis was done with PLS analysis producing measurement and structural models. All constructs emerging from the path measurement model had a composite reliability above 0.7, except for Prior Experience. The structural model identified the strength of relationships between constructs and Intent to Use. The constructs having the strongest relationship and effect with Intent to Use included Perceptions of Utility ($ß=0.524$, $p=0.000$). The structural model also supports the established concept that Intent to Use is related to Use ($ß=0.412$, $p=0.000$). The other constructs were not statistically significant and weak indicators of effect.

The thematic analysis process that was applied to the qualitative survey items elicited key concepts evident in the data. There were responses and aspects of the participants understandings that overlapped the identified themes/categories. However, this should be viewed as an advantageous interpretation of understandings and attitudes, which are not made of isolated concepts but are relative to each other.

Chapter five presents a discussion and implications of the data analysis results and findings provided in Chapter four.

CHAPTER FIVE: DISCUSSION

This purpose of the study was to examine the intent to use and behavioral use of VAPE by accredited EMS education program faculty and staff for prehospital provider education. Chapter five includes the summary and discussion of the results presented in Chapter Four. Each of the research questions along with the results relative to each question are presented. The chapter concludes with recommendations for practice and future research.

There have been numerous advances in technology including new computer applications, web-based curriculum content/materials, and online learning practices during the careers of most practicing educators. Many educators have not maintained their technological skills, do not have access to training/support, and fail to effectively integrate modern technologies. Many find they lack time to research new technologies and create plans to integrate their use into the curriculum. Administration often complicates the matter by failing to support more costly technologies and emphasizing invention of tools, neglecting the dissemination of current technology. As a result of these trends, there is limited acceptance and use of new tools by educators.

The purpose of this study was to examine the intention and behavioral use of VAPE by EMS educators working with/teaching for accredited programs. Intention to use has been determined to be an important indicator for behavior use of technology (Alshare et al., 2009; Venkatesh et al., 2003). The study design leveraged a uniquely extended version of the TAM incorporating PU, PEOU, prior experience, technological competency, social norms, and personality characteristics constructs of EMS education program faculty and staff into a single model. The model provided an opportunity to investigate factors influencing EMS educator intention to use and integrate technology, including personality characteristics. The analysis included several iterations of Exploratory factor analysis to determine latent factors and partial least squares analysis to confirm the measurement model and develop a path model.

Researchers have investigated factors impacting intention and use of technology by members of an organization (Davis, 1989; Venkatesh & Davis, 2000). The most widely used model for explanation of technology acceptance, intention to use, and behavioral use is the technology acceptance model (TAM). The TAM theorizes the individual's perception of utility, their intent to use, and behavioral use of a given technology. The theoretical model adapted from the original TAM sought to measure the influence of 12 latent factors on the intention of an EMS educator to use VAPE. Because intention to use has been reported as a predictor of behavioral use, the relationship between intention and actual use was also investigated to confirm the relationship in an educational setting.

Summary of the Findings

Of the participants who completed the survey, the majority were male (71.1%), held a baccalaureate degree (39.4%), taught for an associate degree program (48.6%), and had less than 20 years of experience as an educator (17.3, SD±9.8). Additionally, most respondents scored the highest in conscientiousness (31.0%) compared to the other personality characteristics.

Five iterations of Exploratory factor analysis were completed. The theoretical model was cultivated with each iteration by removal of unrelated items and factor reduction. The final EFA-V revealed 7 factors representing 57.66% of variance in Intention to Use, a reduction from the theoretical model. Final included factors were: Factor 1: Perceptions of Utility (Perceived Usefulness, Perceived Ease of Use, and Social Norms were collapsed to compose this factor); Factor 2: Stability; Factor 3: Agreeableness; Factor 4: Extraversion; Factor 5: Conscientiousness; Factor 6: Technological Competency; and Factor 7: Prior Experience. The last step in the analysis was creation of a measurement and structural model using PLS. The factors and findings are discussed in relation to the research questions below.

A total of 6 questions were addressed in the present study, the results for each are addressed in this section. Additionally, Table 16 provides a summary of findings related to the research questions and factors.

1. Do the attitudes of EMS education program faculty/staff regarding PU impact intention to use and behavioral use of VAPE?

2. Do the attitudes of EMS education program faculty/staff regarding PEOU impact intention to use and behavioral use of VAPE?

3. Do social norms impact the intention to use and behavioral use of VAPE by EMS education program faculty/staff?

EFA was used to determine identifiable constructs. EFA was complete in five iterations identifying and clustering survey items into 7 latent factors/constructs. Four items from the survey were intended to measure PU, another four to measure PEOU, and two to measure social norms. All items from PU, PEOU, and social norms were salient with the same factor. Therefore, the original factors from the theoretical model were collapsed together and renamed, Perceptions of Utility. All ten items had factor structure coefficients above 0.5 (Stevens, 2002). In the path analysis, Perceptions of Utility was statistically significant and positively associated with a strong effect on Intent to Use (ß=0.524, p=0.000). As a result, the null hypotheses ($H1_{0}$, $H2_{0}$, & $H3_{0}$) related to research questions 1, 2, and 3 were rejected. The perceptions of utility regarding VAPE are associated with an increased intent to use and behavioral use of VAPE. These findings align with previously reported studies in the literature and reiterate the impact of perceptions of utility on intention to use new technologies.

> $H1_0$: The PU of VAPE will not be associated with an increased intent to use and behavioral use of.
> $H1_1$: The PU of VAPE will be associated with an increased intent to use and behavioral use of.
>
> $H2_0$: The PEOU of VAPE will not be associated with an increased intent to use and behavioral use of.
> $H2_1$: The PEOU of VAPE will be associated with an increased intent to use and behavioral use of.
>
> $H3_0$: The perception of social pressure to use/not use VAPE will not be associated with an increased intent to use and behavioral use of.
> $H3_1$: The perception of social pressure to use/not use VAPE will be associated with an increased intent to use and behavioral use of.

4. Do personality characteristics impact intention to use and behavioral use of VAPE by EMS education program faculty/staff?

Personality factors were determined using the Big Five Personality Test, an example of the FFM. This self-report test measures personality traits using the International Personality Item Pool Big-Five Factor Markers. The original survey contained all 50 items constituting the Big-Five Factor Model. There was a total of 10 items for each of the five personality characteristics (Stability, Agreeableness, Extraversion, Conscientiousness, and Intellect). Eight items from Stability, six items from Agreeableness, five items from Extraversion, and six items from Conscientiousness aligned with their respective factors. All items from the original construct Intellect were removed from the analysis and model. In the path analysis, Agreeableness was statistically significant and positively associated with a weak effect on Intent to Use (ß=0.150, p=0.026). The other personality constructs were not statistically significant. As a result, the null hypotheses ($H4_0$) related to research question 4 was rejected regarding the Agreeableness personality characteristic. The users' Agreeableness impacts their intention to use and behavioral use of VAPE. Regarding Stability, Extraversion, Conscientiousness, and Intellect the null hypotheses are accepted. This suggests that individuals exhibiting Agreeableness, over the other characteristics, had a greater intent to use VAPE. Study participants who exhibited high levels of Agreeableness, may be more susceptible to social desirability bias and considered intent to use VAPE as a desirable attribute.

> $H4_0$: The users personality characteristics will not impact their intention to use and behavioral use of VAPE.
> $H4_{1:}$ The users personality characteristics will impact their intention to use and behavioral use of VAPE.

5. Does technological competency (self-efficacy) impact the likelihood of intention to use and behavioral use of VAPE by EMS education program faculty/staff?

Technological competency was retained as a construct in the EFA. Three items from the survey were intended to measure technological competency. Items were related to interaction with technology, technology training, and streaming of online content. All items from technological competency were salient with the same factor. Therefore, the original factor from the theoretical model was retained. All three items had factor structure coefficients above 0.5 (Stevens, 2002). In the path analysis, technological competency was not statistically significant (ß=0.023, p=0.753). As a result, the null hypotheses ($H5_0$) related to research question 5 is accepted. The users' technological competency does not impact their intent to use and behavioral use of VAPE.

> $H5_0$: The users' technological competency will not impact their intent to use, and behavior use of VAPE
> $H5_1$: The users' technological competency will impact their intent to use, and behavior use of VAPE

6. Does the prior experience of EMS education program faculty/staff impact the likelihood of intention to use and behavioral use of VAPE?

Prior experience was retained as a construct in the EFA. Three items from the survey were intended to measure prior experience. Items were related to experience as an educator, experience as a medical provider, and previous use of ReelDX. Two items from prior experience were salient with the same factor, previous use of ReelDX was removed through EFA. Structure coefficients for both items were below 0.5 (Stevens, 2002). In the path analysis, prior experience was not statistically significant (ß= -0.053, p=0.455). However, the construct is composed of only two items rendering it unacceptable. The users' prior experience does not impact their intent to use and behavioral use of VAPE.

> $H6_0$: The prior experience of faculty/staff will not impact their intention to use and behavioral use of VAPE.
> $H6_1$: The prior experience of faculty/staff will impact their intent to use and behavioral use of VAPE.

The study examined several factors and their potential impact on intention to use. Intention to use was measured using traditional TAM items developed by Davis (1989). The questionnaire asked users to indicate the likelihood they would use VAPE if they had access. Behavioral use of VAPE was expected as many EMS educational programs were forced to move their course content online due to social distancing requirements resultant of COVID-19. The questionnaire asked users to indicate the frequency with which they utilize VAPE to enhance and deliver content. In the path analysis, intention to use was statistically significant and positively associated with a moderate effect on behavioral use (ß=0.412, p=0.000). This finding is consistent with previously conducted studies in the literature (Alshare et al., 2009; Christensen, 2002; Davis, 1989; Davis et al., 1992; Sullivan, 2012; Venkatesh et al., 2003).

Table 19 Summary table of significant findings based on the research model

Research Questions	Factor	Sig.	Explanation
1 2 3	Perceptions of Utility	0.000	Relationship
4	Stability Agreeableness Extraversion Conscientiousness	0.411 0.026 0.520 0.059	No relationship Relationship No relationship No relationship
5	Technological Competency	0.753	No relationship
6	Prior Experience	0.455	No relationship

The Importance of the Factors

This study has provided information useful for individuals interested in promoting the integration of VAPE technology by EMS educators within the context of prehospital curriculum. The awareness offered by this study affords a better understanding of factors impacting an educator to desire VAPE technology integration. There are three statistical measures that indicate the importance of the factor: effect strength of the independent factor on the dependent factor, the amount of variance accounted for, and the factor strength.

Perceptions of Utility: Factor 1

The traditional TAM constructs of Perceived Usefulness, Perceived Ease of Use, and Social Norms were combined in factor 1 and re-labeled Perceptions of Utility. The traditional TAM constructs were combined based on finding from the rotated factor matrix (all TAM related items loaded on the same factor in each iteration of the EFA) as well as additional studies where similar constructs were summed. These constructs define an individual's general discernment regarding the use of a particular technology. These constructs have been extensively tested in a variety of organizational settings and found to be significant predictors of intention to use (Alshare et al., 2009; Christensen, 2002; Davis, 1989; Yang et al., 1999). The results of this study support those of others reporting a relationship between perceptions of utility and intention to use. In this study perceptions of utility proved to have the strongest effect on intention to use. Individual perceptions are difficult to measure, impact, and change (Rokeach, 1968). However, opinions have been shown to be influenced by culture and administrative leadership (Pajares, 1992; Nespor, 1987; and Sugar et al., 2005). Interventions can be targeted to improved educator viewpoints towards VAPE and technology in general. Institution administrators should take responsibility for culture and work towards developing one that is supportive of technology integration, as well as faculty and student use.

Social norms are a construct which refers to the degree an individual believes their peers and colleagues consider something to be important. Previous literature has found social influence to be significant in mandatory setting and during an early adoption phase (Venkatesh & Davis, 2000). Individuals may change their intentions to align with social influence, when they may be rewarded, or when they may be reprimanded. The opinions of others conceivably influence the mindset of an individual towards VAPE or other technologies.

Personality Characteristics: Factor 2-5

Of the five personality characteristics constituting the Big Five Personality test, 4 characteristics were included in the final model. Intellect was removed during factor analysis. Of the four included characteristics, agreeableness was found to be statistically significant with a weak association to intent to use. The other included personality characteristics were not statistically significant. This suggests moderate evidence that individuals who exhibit agreeableness have greater intent to use VAPE than those who do not.

An individual's perceptions and opinions may be influenced by the characteristics and make up of their individual personality. Further research is needed to assess the impact of personality on constructs such as perceived usefulness, perceived ease of use, and social norms.

Technological Competency: Factor 6

Technological competency is one's ability to use a technology. Venkatesh and Davis (2000) hypothesized that individual ability, termed self-efficacy, would not have a direct effect on behavioral intention. This study supports that original hypothesis, technological competency was not statistically significant. However, other researchers have found a positive relationship between competency and intention to use revealing a need for further definition and investigation (Ajzen, 1991).

Prior Experience: Factor 7

This study involved examining the impact of prior experience as a predictor variable of intention to use. For this study prior experience was identified as time in years as an EMS clinician, time in years as an EMS educator, and previous use of a specific VAPE software application (ReelDX). Previous use of ReelDX was removed during factor analysis, leaving two items in factor 7. In the path model prior experience was not statistically significant indicating that experience as a prehospital care provider and educator have no bearing on an individual's willingness to use VAPE.

Discussion of the Findings

The survey presented to faculty and staff currently working for an accredited EMS program was intended to measure constructs in relation to intention to use VAPE. In both the factor analysis and the measurement model of the PLS, items clustered into seven constructs which were found to be reliable and valid. However, only two of the seven factors were found to be statistically significant: perceptions of utility and agreeableness. In addition, intention to use was identified as a predictor of actual use.

While the content of EMS curriculum is dictated by regulatory bodies governing the profession, how content is delivered is determined by educators. It would benefit educators, administrators, and software developers to understand factors which drive educators to use and create activities which require the use of technology.

According to the findings, the greatest influence on intention to use VAPE by EMS educators were their perceptions of utility. A finding supported by a multitude of previous studies related to TAM. An individual who feels negatively towards a given technology, or perceives that technology to be viewed negatively, is less likely to have intention to use it. The possibility exists that individuals are unfamiliar or inexperienced with technology and underestimate its utility and impact. Why an educator may have an undesirable opinion of VAPE could be based on experience, lack of training/physical support, time limitations, cost, or lack of institutional support.

Apart from agreeableness, personality characteristics were found to have no effect on educator intention to use VAPE. Despite statistically significant findings for agreeableness in the path model, the influence on intention to use was determined to be weak.

In summary, analysis of the results revealed Factor 1: Perceptions of Utility had a strong positive impact on intention to use VAPE by EMS educators. Additionally, intention to use was associated with behavioral usage.

Table 20 Summary of key findings

	PU	ST	AG	EX	CO	TC	PE
AVE	**0.561**	0.308	0.482	0.469	0.364	**0.658**	0.123
Composite Reliability	**0.927**	**0.750**	**0.847**	**0.811**	**0.750**	**0.852**	0.000
ß	**0.524**	0.146	0.150	-0.066	0.224	0.023	-0.053
p-value	**0.000**	0.411	**0.026**	0.059	0.059	0.753	0.455

Qualitative Findings

The EMS clinical curriculum requires numerous specific patient types, impressions, complaints, and skill iterations. EMS students struggle to meet required minimums related to high acuity level patients, impressions and complaints rarely occurring in the pre-hospital environment, and invasive procedures. Educators are responsible to find solutions to these infrequent interactions and ensure student competency. Most respondents reported that VAPE could meet their educational needs and improve student learning through demonstration of patient pathologies and provider patient care skills rarely encountered by students. One respondent stated that VAPE provides *"...an opportunity to see a condition or treatment that cannot be seen in an actual clinical setting. Ensure that students are exposed to many different types of patients and conditions."* Numerous responses identified VAPE is an opportunity for students to increase and support learning. Subsequently leading to improved performances on cognitive and psychomotor examinations.

Respondents also reported that VAPE could improve student learning by presenting material in an audio/visual format, particularly for students with those learning preferences.

Despite respondents identifying VAPE as a valuable tool, reported utilization was low. Subscriptions to applications supplying a library of videos can be costly, with per user pricing and annual renewals. EMS education programs, like many allied health programs, are expensive to operate and have limited funding. Program administrators often shift limited funds to crucial items for student skills such as intravenous catheters, cardiac monitors, task trainers, and high-fidelity simulation mannequins. This is obvious in numerous responses from participants.

"*The program I am currently working for is small and underfunded. We often have to find very unique ways to spend the little money that we do have.*"

Respondents additionally reported constraints on their time and technological abilities. Faculty and staff expectations are increasing insurmountable and regularly include full time teaching loads, administrative duties, scholarship, and service. Increased workloads make it difficult for educators to find and familiarize themselves with new and innovative resources or integrate them in meaningful ways.

Respondents denoted administrative support as a challenge to adoption, *"getting administration approval, current leadership is ignorant of the ways simulation and technology can be useful in the classroom. Without leadership support it may not be able to be implemented effectively."* The administration that underpins educational programs is key to providing a well-rounded education to students as institution administrators oversee the operations of various programs. Administrators may not have a related background to and are confronted with an array of needs by the programs they supervise. These conflicts may lead to the inclusion or exclusion of technologies, which may significantly impact educational programs and student outcomes.

Recommendations for Further Research

The results of this study expand the research on how personality characteristics may influence behavior through the examination of their relationship with intent to use VAPE by EMS educators. This study also broadens the research on traditional TAM constructs as they apply to a specific set of educators and new technology, videos of authentic patient encounters. Conducting a study that connects fields of management and psychology with educational technology adds to the body of knowledge and empirical investigation in multiple disciplines.

The findings have several implications for research within education. A unique version of the TAM used in the present study was found to be a stable and predictive model of intention to use VAPE by EMS educators. Therefore, the study contributes to behavior intention research by providing a new context for the adapted TAM in an educational setting. Literature supports successive versions of the model have continued to refine the explored relationships, while increasing the number of predictors. The goal is to improve the understanding of technology adoption and cultivate the theoretical framework.

The research model should be retested with a broader and larger sample of educators and could include additional allied health professions (nursing, physical therapy, respiratory therapy, etc..). Evaluating TAM constructs in their original formation to evaluate their impact on intent to use VAPE could provide insight as to how educator perceptions could be changed. Additional research may also consider examining the effect of personality characteristics on original TAM constructs (PU, PEOU, and social norms) in addition to their direct impact on intent to use. Furthermore, supplementary analysis of the data collected may discover factors that impact the likelihood educators serve in various roles.

An important area for future research is the examination of other predictors for behavioral intention, including constraints on use and institutional leadership.

Conclusion

The present study has contributed to the practice of EMS education as the findings can be used to improve the intention to use VAPE and allow educators/institutions to make informed decisions regarding this technology. Educators and administrators should be aware of the influence on technology adoption and use. This knowledge can be used to create initiatives to seek out applicable technologies, increase technology use, and develop appropriate training/support to fulfill those initiatives. Positive experiences through professional development and demonstration can improve intention and behavior use, ultimately increasing the richness of curriculum.

The current study showed in the context of EMS education use, prediction of intention to use was driven by perceptions of utility. Personality characteristics, prior experience, and technological competency had little or no impact on instructor intention. Continued research is needed to verify the relative impact of personality characteristics on intention to use VAPE and other educational technologies. The findings indicate EMS educators do not rely on their experience as a provider/educator or their ability to utilize technology in decisions to integrate VAPE. Educator decisions are made based on their individual perception of the applicable nature, ease of use, and climate of opinion related to VAPE.

The study was developed because of a paucity of EMS educational research, influence of personality characteristics, and a lack of technology usage in EMS education as suggested by the literature. While many EMS education programs have access to various technologies, they are under-utilized. Largely, the study confirmed the important roles of perceptions of utility on influencing behavioral intention of EMS educators. It is imperative educator perceptions be understood to increase the opportunity for students to utilize technology in ways relevant to their chosen field, aiding them in successful mastery of curriculum.

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APPENDIX A

Variable Names and Data Types

Construct	Survey Item	Variable Name	Variable type
Perceived Usefulness	Integration of videos of Authentic patient encounters recorded in clinical settings into EMS curriculum enhances content.	PU 1	Ordinal
	The use of videos of Authentic patient encounters recorded in clinical settings can improve student cognition of EMS curriculum.	PU 2	Ordinal
	I find videos of Authentic patient encounters recorded in clinical settings to be useful for training and educational activities.	PU 3	Ordinal
	Using videos of Authentic patient encounters recorded in clinical settings makes me a more effective educator.	PU 4	Ordinal
Perceived Ease of Use	The objectives for using and integrating videos of Authentic patient encounters recorded in clinical settings are apparent.	PEOU 1	Ordinal
	Integrating videos of Authentic patient encounters recorded in clinical settings in EMS education is uncomplicated.	PEOU 2	Ordinal
	It is easy to use videos of Authentic patient encounters recorded in clinical settings to accurately convey	PEOU 3	Ordinal

Construct	Survey Item	Variable Name	Variable type
	EMS curriculum content.		
	Aligning videos of Authentic patient encounters recorded in clinical settings with EMS curriculum objectives is straightforward.	PEOU 4	Ordinal
Demographics	What is your age?	Age	Ratio
	What gender do you identify as?	Gender	Categorical
	What is the highest degree or level of school you have completed?	Education	Categorical
	What type of EMS education program do you work for?	ProgramType	Categorical
	Which of the following best describes your current role in the EMS education program you work for?	Role	Categorical
	In what geographical region is your program located?	Region	Categorical
	In what type of community is your program located?	CommunityType	Categorical
Educator experience	Counting this year, how many years have you been actively teaching/designing EMS curriculum?	TeachingTime	Ratio
Provider experience	If applicable, counting this year how many years of prehospital	ProviderTime	Ratio

Construct	Survey Item	Variable Name	Variable type
	clinical experience do you have?		
Previous Use	I have previously utilized ReelDX to access videos of Authentic patient encounters recorded in clinical settings for prehospital education.	ReelDXUse	Categorical
Technological competency	I have regular opportunities to interact with educational technologies such as; learning management systems, task trainers, simulation mannequins, etc...	TechInteraction	Ordinal
	I have regular opportunities to participate in training for new educational technologies.	TechTraining	Ordinal
	I have prior experience with streaming educational video content.	Streaming	Ordinal
Social norms	My colleagues think videos of Authentic patient encounters recorded in clinical settings are useful educational tools.	PeerVideoOp	Ordinal
	My colleagues think I should use videos of Authentic patient encounters recorded in clinical settings.	PeerUseOp	Ordinal
Extraversion	I am the life of the party.	Extraversion 1	Ordinal

Construct	Survey Item	Variable Name	Variable type
	I don't talk a lot.	Extraversion 2	Ordinal
	I feel comfortable around people.	Extraversion 3	Ordinal
	I keep in the background.	Extraversion 4	Ordinal
	I start conversations.	Extraversion 5	Ordinal
	I have little to say.	Extraversion 6	Ordinal
	I talk to a lot of different people at parties.	Extraversion 7	Ordinal
	I don't like to draw attention to myself.	Extraversion 8	Ordinal
	I don't mind being the center of attention.	Extraversion 9	Ordinal
	I am quiet around strangers.	Extraversion 10	Ordinal
Agreeableness	I feel little concern for others.	Agreeableness 1	Ordinal
	I am interested in people.	Agreeableness 2	Ordinal
	I insult people.	Agreeableness 3	Ordinal
	I sympathize with others' feelings.	Agreeableness 4	Ordinal
	I am not interested in other people's problems.	Agreeableness 5	Ordinal

Construct	Survey Item	Variable Name	Variable type
	I have a soft heart.	Agreeableness 6	Ordinal
	I am not really interested in others.	Agreeableness 7	Ordinal
	I take time out for others.	Agreeableness 8	Ordinal
	I feel others' emotions.	Agreeableness 9	Ordinal
	I make people feel at ease.	Agreeableness 10	Ordinal
Conscientiousness	I am always prepared.	Conscientiousness 1	Ordinal
	I leave my belongings around.	Conscientiou 9sness 2	Ordinal
	I pay attention to details.	Conscientiousness 3	Ordinal
	I make a mess of things.	Conscientiousness 4	Ordinal
	I get chores done right away.	Conscientiousness 5	Ordinal
	I often forget to put things back in their proper place.	Conscientiousness 6	Ordinal
	I like order.	Conscientiousness 7	Ordinal
	I shirk my duties.	Conscientiousness 8	Ordinal
	I follow a schedule.	Conscientiousness 9	Ordinal

Construct	Survey Item	Variable Name	Variable type
	I am exacting in my work.	Conscientiousness 10	Ordinal
Neuroticism	I get stressed out easily.	Neuroticism 1	Ordinal
	I am relaxed most of the time.	Neuroticism 2	Ordinal
	I worry about things.	Neuroticism 3	Ordinal
	I seldom feel blue.	Neuroticism 4	Ordinal
	I am easily exhausted.	Neuroticism 5	Ordinal
	I get upset easily.	Neuroticism 6	Ordinal
	I change my mood a lot.	Neuroticism 7	Ordinal
	I have frequent mood swings.	Neuroticism 8	Ordinal
	I get irritated easily.	Neuroticism 9	Ordinal
	I often feel blue.	Neuroticism 10	Ordinal
Openness	I have a rich vocabulary.	Openness 1	Ordinal
	I have difficulty understanding abstract ideas.	Openness 2	Ordinal
	I have a vivid imagination.	Openness 3	Ordinal

Construct	Survey Item	Variable Name	Variable type
	I am not interested in abstract ideas.	Openness 4	Ordinal
	I have excellent ideas.	Openness 5	Ordinal
	I do not have a good imagination.	Openness 6	Ordinal
	I am quick to understand things.	Openness 7	Ordinal
	I use difficult words.	Openness 8	Ordinal
	I spend time reflecting on things.	Openness 9	Ordinal
	I am full of ideas.	Openness 10	Ordinal
Behavioral intention to use	Assuming I had access to videos of Authentic patient encounters recorded in clinical settings; I intend to use them.	Intent	Ordinal
Behavioral use	I frequently utilize videos of Authentic patient encounters recorded in clinical settings to enhance and deliver EMS curriculum content.	Use	Ordinal
Educational needs	In what ways can videos of Authentic patient encounters recorded in clinical settings serve your educational needs?	Educational needs	Qualtitative/Themed
Improved learning	Do you think videos of Authentic patient encounters recorded in	Improved learning	Qualtitative/Themed

Construct	Survey Item	Variable Name	Variable type
	clinical settings can help students learn EMS content? Why?		
Adoption challenges	3. What are the challenges you face in adoption and use of applications such as ReelDX?	Challenges	Qualtitative/Themed

APPENDIX B

Survey Questions by Dimension

Attitude

Perceived Usefulness

1. Integration of videos of authentic patient encounters recorded in clinical settings into EMS curriculum enhances content.

2. The use of videos of authentic patient encounters recorded in clinical settings can improve student cognition of EMS curriculum.

3. I find videos of authentic patient encounters recorded in clinical settings to be useful for training and educational activities.

4. Using videos of authentic patient encounters recorded in clinical settings makes me a more effective educator.

Perceived Ease of Use

1. The objectives for using and integrating videos of authentic patient encounters recorded in clinical settings are apparent.

2. Integrating videos of authentic patient encounters recorded in clinical settings in EMS education is uncomplicated.

3. It is easy to use videos of authentic patient encounters recorded in clinical settings to accurately convey EMS curriculum content.

4. Aligning videos of authentic patient encounters recorded in clinical settings with EMS curriculum objectives is straightforward.

Demographics

1. What is your age?

2. What gender do you identify as?

a. Male

b. Female

c. Trans-gender

d. Non-binary

e. Prefer not to answer

f. Other

3. What is the highest degree or level of school you have completed?

a. High school graduate, diploma or the equivalent

b. Some college credit, no degree

c. Trade/technical/vocational training

d. Associate degree

e. Bachelor’s degree

f. Master’s degree

g. Doctorate degree

h. Prefer not to answer

f. Other

4. What type of EMS education program do you work for?

a. Non-degree program

b. Associate degree program

c. Bachelor’s degree program

5. Which of the following best describes your current role in the EMS education program you work for?

a. Staff

b. Advisor

c. Instructor

d. Clinical Education Coordinator

e. Program Director

f. Medical Director

g. Other

6. In what geographical region is your program located?

a. The Midwest (Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin)

b. The South (Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Oklahoma, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia)

c. The Northeast (Maine, New Hampshire, Massachusetts, Connecticut, Vermont, Rhode Island)

d. The West (Colorado, New Mexico, Arizona, Utah, Montana, Nevada, Idaho, California, Washington, Oregon, Hawaii, Alaska)

7. In what type of community is your program located?

a. Urban

b. Rural

c. Suburban

<u>Prior Experience</u>

1. Counting this year, how many years have you been actively teaching/designing EMS curriculum?

2. If applicable, counting this year how many years of prehospital clinical experience do you have?

3. I have previously utilized ReelDX to access videos of authentic patient encounters recorded in clinical settings for prehospital education.

a. Yes

b. No

<u>Technological Competency</u>

1. I have regular opportunities to interact with educational technologies such as; learning management systems, task trainers, simulation mannequins, etc...

2. I have regular opportunities to participate in training for new educational technologies.

3. I have prior experience with streaming educational video content.

<u>Social Norms</u>

1. My colleagues think videos of authentic patient encounters recorded in clinical settings are useful educational tools.

2. My colleagues think I should use videos of authentic patient encounters recorded in clinical settings.

<u>Personality</u>

1. I am the life of the party.

2. I feel little concern for others.

3. I am always prepared.

4. I get stressed out easily.

5. I have a rich vocabulary.

6. I don’t talk a lot.

7. I am interested in people.

8. I leave my belongings around.

9. I am relaxed most of the time.

10. I have difficulty understanding abstract ideas.

11. I feel comfortable around people.

12. I insult people.

13. I pay attention to details.

14. I worry about things.

15. I have a vivid imagination.

16. I keep in the background.

17. I sympathize with others’ feelings.

18. I make a mess of things.

19. I seldom feel blue.

20. I am not interested in abstract ideas.

21. I start conversations.

22. I am not interested in other people’s problems.

23. I get chores done right away.

24. I am easily exhausted.

25. I have excellent ideas.

26. I have little to say.

27. I have a soft heart.

28. I often forget to put things back in their proper place.

29. I get upset easily.

30. I do not have a good imagination.

31. I talk to a lot of different people at parties.

32. I am not really interested in others.

33. I like order.

34. I change my mood a lot.

35. I am quick to understand things.

36. I don't like to draw attention to myself.

37. I take time out for others.

38. I shirk my duties.

39. I have frequent mood swings.

40. I use difficult words.

41. I don't mind being the center of attention.

42. I feel others' emotions.

43. I follow a schedule.

44. I get irritated easily.

45. I spend time reflecting on things.

46. I am quiet around strangers.

47. I make people feel at ease.

48. I am exacting in my work.

49. I often feel blue.

50. I am full of ideas.

Behavioral Intention to Use

1. Assuming I had access to videos of authentic patient encounters recorded in clinical settings; I intend to use them.

Behavioral Use

1. I frequently utilize videos of authentic patient encounters recorded in clinical settings to enhance and deliver EMS curriculum content.

1. In what ways can videos of authentic patient encounters recorded in clinical settings serve your educational needs?

2. Do you think videos of authentic patient encounters recorded in clinical settings can help students learn EMS content? Why?

3. What are the challenges you face in adoption and use of applications such as ReelDX?

APPENDIX C

Exploratory Factor Analysis I (EFA-I) Statistics

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.620
Bartlett's Test of Sphericity	Approx. Chi-Square	5003.650
	df	2145
	Sig.	<0.001

EFA-I Parallel Analysis		
Component	Eigenvalue of the actual data	Eigenvalue of the simulated data
1	7.604	2.676
2	5.580	2.518
3	4.412	2.397
4	3.620	2.303
5	3.429	2.211
6	3.187	2.122
7	2.400	2.042
8	2.198	1.978
9	**1.813**	**1.916**
10	1.797	1.850

EFA-I Eignevalues and Variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.604	11.521	11.521	7.604	11.521	11.521	5.371	8.139	8.139
2	5.580	8.454	19.974	5.580	8.454	19.974	4.977	7.541	15.679
3	4.412	6.685	26.660	4.412	6.685	26.660	4.154	6.294	21.974
4	3.620	5.484	32.144	3.620	5.484	32.144	3.290	4.985	26.958
5	3.429	5.195	37.339	3.429	5.195	37.339	2.686	4.070	31.029
6	3.187	4.829	42.168	3.187	4.829	42.168	2.563	3.884	34.912
7	2.400	3.636	45.804	2.400	3.636	45.804	2.513	3.807	38.720
8	2.198	3.330	49.134	2.198	3.330	49.134	2.340	3.546	42.266
9	1.813	2.747	51.881	1.813	2.747	51.881	2.196	3.327	45.592
10	1.797	2.723	54.604	1.797	2.723	54.604	2.150	3.258	48.850
11	1.564	2.369	56.973	1.564	2.369	56.973	2.122	3.215	52.065
12	1.463	2.216	59.189	1.463	2.216	59.189	2.054	3.112	55.177
13	1.415	2.144	61.333	1.415	2.144	61.333	1.888	2.860	58.037
14	1.329	2.014	63.347	1.329	2.014	63.347	1.850	2.804	60.841
15	1.283	1.943	65.290	1.283	1.943	65.290	1.688	2.558	63.399
16	1.160	1.758	67.048	1.160	1.758	67.048	1.565	2.371	65.769

EFA-I Eignevalues and Variance									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
17	1.095	1.660	68.708	1.095	1.660	68.708	1.546	2.342	68.112
18	1.070	1.621	70.329	1.070	1.621	70.329	1.464	2.218	70.329
19	.989	1.498	71.827						
20	.941	1.426	73.253						
21	.921	1.396	74.649						
Extraction Method: Principal Component Analysis.									

APPENDIX D

Exploratory Factor Analysis II (EFA-II) Statistics

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.620
Bartlett's Test of Sphericity	Approx. Chi-Square	5003.650
	df	2145
	Sig.	<0.001

EFA-II Eignevalues and Variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.604	11.521	11.521	7.604	11.521	11.521	5.962	9.033	9.033
2	5.580	8.454	19.974	5.580	8.454	19.974	5.377	8.147	17.180
3	4.412	6.685	26.660	4.412	6.685	26.660	4.778	7.239	24.419
4	3.620	5.484	32.144	3.620	5.484	32.144	4.125	6.250	30.669
5	3.429	5.195	37.339	3.429	5.195	37.339	3.820	5.787	36.457
6	3.187	4.829	42.168	3.187	4.829	42.168	3.410	5.167	41.624
7	2.400	3.636	45.804	2.400	3.636	45.804	2.619	3.969	45.593
8	2.198	3.330	49.134	2.198	3.330	49.134	2.337	3.542	49.134
9	1.813	2.747	51.881						

EFA-II Eignevalues and Variance									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
10	1.797	2.723	54.604						
11	1.564	2.369	56.973						
12	1.463	2.216	59.189						
13	1.415	2.144	61.333						
14	1.329	2.014	63.347						
15	1.283	1.943	65.290						
16	1.160	1.758	67.048						
17	1.095	1.660	68.708						
18	1.070	1.621	70.329						
19	.989	1.498	71.827						

EFA-II Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
PEOU_3	.807	.025	-.196	.028	-.026	-.043	-.074	.081
PU_3	.794	.093	-.020	.153	.055	-.095	.062	-.122
PU_2	.793	.050	.108	.132	.144	.003	.048	-.096
PU_4	.770	.078	.055	.148	-.067	-.099	.094	.010
PU_1	.763	.018	.018	.105	.150	-.004	.110	-.088
PEOU_1	.735	.011	-.073	.012	.002	.022	-.156	.069
PEOU_4	.682	-.127	-.141	.006	.083	-.001	-.207	.140
PeerUseOp	.681	.012	-.081	-.075	.167	.148	.051	.023
PeerVideoOp	.678	-.046	-.119	-.069	.158	.297	-.003	-.024
PEOU_2	.651	-.153	-.237	-.066	-.045	.128	-.082	.134
Stability_6	.100	.765	.018	-.019	-.186	.016	.001	.013
Stability_10	-.044	.693	.141	-.167	.096	-.116	.028	.038
Stability_9	.039	.673	.096	-.162	.059	.094	.264	.028
Stability_1	.016	.642	.080	.124	-.048	.202	-.188	.021
Stability_2	.109	-.640	-.043	.031	.056	.102	.163	.208
Stability_3	.019	.636	.090	.125	-.002	.249	.038	.162
Stability_7	-.003	.627	.046	-.105	.105	-.174	.142	.078
Stability_8	-.007	.600	.025	-.039	-.136	-.156	.254	.171
Stability_5	-.086	.597	.106	.028	.018	-.087	-.246	.059
Stability_4	-.064	-.504	.147	-.100	.006	.033	-.089	.309
Intellect_2	.121	.371	.092	.170	-.267	.274	-.290	.340
Extraversion_10	-.149	.043	.759	-.033	.072	-.071	.005	.057
Extraversion_4	.004	.054	.749	.036	-.037	.106	.121	.124
Extraversion_2	.025	-.072	.731	-.163	-.047	-.012	-.036	.242
Extraversion_1	.042	-.100	-.626	.010	.136	.161	-.013	.182
Extraversion_6	.020	-.041	.624	.017	-.236	.113	-.028	.388
Extraversion_7	.110	-.175	-.589	.207	-.088	.135	-.003	.322
Extraversion_5	.146	-.054	-.585	.313	-.162	.105	.174	.058
Extraversion_9	.236	-.027	-.578	.051	.306	-.108	.067	.234
Extraversion_8	-.131	.063	.563	.128	-.075	.132	.018	-.087
Extraversion_3	.013	-.282	-.351	.300	-.130	.043	.271	.085
Intellect_6	.063	.220	.322	-.135	-.034	.267	-.075	.004
Agreeableness_9	-.008	.144	-.049	.782	.044	-.112	-.063	.106
Agreeableness_4	.119	.064	.025	.697	-.095	-.013	.151	-.157

EFA-II Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
Agreeableness_6	-.121	.142	.001	.631	.157	.063	-.155	.045
Agreeableness_7	-.080	.051	.192	-.630	.082	.151	-.007	.128
Agreeableness_8	.066	-.251	.038	.582	.181	.116	-.021	.128
Agreeableness_2	.124	-.103	-.197	.578	.148	.047	.072	.134
Agreeableness_10	.066	-.065	-.153	.543	.191	.305	.104	.324
Agreeableness_5	-.105	-.017	.010	-.347	.134	.144	.004	.127
Agreeableness_1	.036	.139	.135	-.262	-.076	-.005	-.194	.188
Intellect_9	-.054	-.056	.086	.223	.206	.186	.132	-.086
Intellect_8	.055	.199	.020	-.176	.658	-.104	.200	-.013
Intellect_1	.003	.109	-.057	-.177	.582	-.112	.103	-.138
Intellect_10	.062	-.155	-.278	.194	.551	.152	.152	.131
TechInteraction	.069	-.161	.109	.090	.548	.173	-.251	-.025
TechTraining	.199	-.181	.061	.127	.544	.094	-.182	.099
Intellect_5	.188	-.021	-.175	.080	.522	.088	.067	.012
Streaming	.317	-.108	.083	-.102	.461	-.084	-.145	.018
Intellect_4	.081	.224	.087	-.225	-.425	.230	.009	.283
Conscientiousness_2	-.104	.325	-.104	.259	.421	-.307	-.071	.204
ReelDXUse	.021	.049	-.048	.038	.246	.078	-.050	.061
Conscientiousness_7	.060	.089	.128	-.022	.100	.689	-.048	-.332
Conscientiousness_5	.027	-.113	-.174	-.087	-.108	.688	.100	.161
Conscientiousness_9	.113	-.002	.031	-.001	-.121	.641	.043	-.067
Conscientiousness_10	-.017	.065	.057	.043	.357	.614	.189	.025
Conscientiousness_1	-.005	-.265	-.007	.039	.145	.483	-.129	-.017
ProviderTime	-.117	.060	-.017	.023	-.091	-.026	.754	.097
TeachingTime	-.012	.018	-.003	.030	-.085	.002	.753	.092
Intellect_7	.069	-.024	-.072	.070	.378	.183	.474	-.026
Conscientiouness_3	-.021	.044	.028	.006	.159	.384	.435	-.175
Conscientiousness_4	-.059	.439	-.060	.034	.025	-.130	.027	.471
Agreeableness_3	-.027	.084	-.225	-.389	.128	-.058	.093	.462
Conscientiousness_8	.106	.130	.151	-.051	-.005	-.290	.209	.424
Intellect_3	.014	-.167	-.295	.173	.332	-.188	.087	.381
Conscientiousness_6	.067	.292	.085	.197	.218	-.236	-.075	.345

Extraction Method: Principal Component Analysis.
Rotation Meth Varimax with Kaiser Normalization.[a]

EFA-II Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
a. Rotation converged in 8 iterations.								

APPENDIX E

Exploratory Factor Analysis III (EFA-III) Statistics

EFA-III KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.666
Bartlett's Test of Sphericity	Approx. Chi-Square	3489.668
	df	1225
	Sig.	<0.001

EFA-III Parallel Analysis		
Component	Eigenvalue of the actual data	Eigenvalue of the simulated data
1	6.608	2.533
2	4.653	2.307
3	3.518	2.215
4	3.249	2.089
5	2.981	2.002
6	2.543	1.924
7	2.194	1.850
8	**1.684**	**1.780**
9	1.530	1.716
10	1.443	1.648

EFA-III Eigenvalues and Variance									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.608	13.216	13.216	6.608	13.216	13.216	5.843	11.685	11.685
2	4.653	9.307	22.522	4.653	9.307	22.522	4.351	8.702	20.387
3	3.518	7.037	29.559	3.518	7.037	29.559	3.457	6.914	27.301
4	3.249	6.497	36.056	3.249	6.497	36.056	3.402	6.804	34.105
5	2.981	5.962	42.018	2.981	5.962	42.018	3.084	6.167	40.272
6	2.543	5.085	47.103	2.543	5.085	47.103	3.080	6.160	46.432
7	2.194	4.388	51.492	2.194	4.388	51.492	2.392	4.785	51.217
8	1.684	3.368	54.860	1.684	3.368	54.860	1.822	3.643	54.860
9	1.530	3.060	57.920						
10	1.443	2.886	60.806						
11	1.220	2.441	63.247						
12	1.167	2.333	65.581						
13	1.112	2.224	67.805						
14	1.047	2.095	69.899						
15	.994	1.988	71.887						
16	.926	1.852	73.740						
17	.804	1.608	75.348						
18	.782	1.564	76.912						
19	.765	1.530	78.442						
20	.748	1.497	79.938						

EFA-III Rotated Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
PEOU_3	.814	.033	-.165	.027	-.024	-.044	-.099	.122
PU_3	.800	.070	-.012	.094	-.128	.079	.116	-.197
PU_2	.800	.049	.101	.115	-.045	.164	.083	-.219
PU_1	.775	.024	.011	.078	-.028	.161	.153	-.225
PU_4	.774	.066	.073	.125	-.147	-.032	.135	-.061
PEOU_1	.737	.011	-.064	.008	.039	-.015	-.173	.072
PEOU_4	.692	-.120	-.141	.071	.011	-.001	-.189	.131
PeerUseOp	.679	-.005	-.048	-.084	.190	.173	.010	.145
PeerVideoOp	.668	-.050	-.093	-.058	.314	.185	-.063	.104
PEOU_2	.649	-.123	-.206	-.019	.191	-.092	-.142	.231
Stability_6	.100	.782	.014	-.011	-.009	-.173	-.033	.039
Stability_10	-.055	.725	.103	-.142	-.120	.111	.010	-.006
Stability_9	.030	.692	.109	-.196	.140	.090	.225	.047
Stability_7	-.018	.666	.026	-.071	-.144	.124	.069	.115
Stability_3	.039	.650	.088	.122	.221	-.025	.067	-.026
Stability_1	.033	.647	.069	.126	.164	-.085	-.167	-.085
Stability_8	-.023	.624	.004	.010	-.118	-.124	.201	.272
Stability_5	-.080	.588	.059	.031	-.171	.017	-.186	-.069
Extraversion_10	-.173	.107	.756	-.068	-.069	.131	-.045	-.053
Extraversion_4	-.011	.083	.751	.017	.112	-.020	.142	-.043
Extraversion_2	.001	-.022	.741	-.132	-.006	-.024	-.053	.155
Extraversion_6	.001	.003	.693	.033	.089	-.211	-.028	.253
Extraversion_8	-.138	.104	.611	.076	.144	-.040	-.066	-.147
Extraversion_1	.057	-.088	-.611	.071	.181	.079	-.004	.098
Agreeableness_9	.018	.124	-.054	.815	-.173	-.071	-.007	-.028
Agreeableness_6	-.092	.158	-.026	.679	-.022	.041	-.127	-.169
Agreeableness_4	.126	.060	.012	.674	-.022	-.148	.138	-.152
Agreeableness_10	.081	-.038	-.111	.650	.264	.126	.062	.221
Agreeableness_8	.086	-.263	.063	.645	.028	.114	.032	-.057
Agreeableness_2	.134	-.104	-.136	.603	.056	.114	-.009	.181
Intellect_9	-.075	-.017	.056	.261	.175	.223	.064	-.112
Conscientiousness_5	.027	-.104	-.157	.002	.735	-.160	.079	.202
Conscientiousness_9	.112	.006	.076	-.060	.686	-.137	.014	-.077

EFA-III Rotated Component Matrix[a]

	Component							
	1	2	3	4	5	6	7	8
Conscientiousness_7	.048	.120	.125	-.037	.681	.118	-.147	-.320
Conscientiousness_10	-.022	.090	.018	.154	.610	.333	.145	-.061
Conscientiousness_1	.006	-.279	-.022	.085	.519	.050	-.118	-.071
Conscientiouness_3	-.036	.055	.043	.018	.444	.192	.336	-.059
Intellect_8	.040	.200	-.002	-.135	-.056	.690	.128	.053
Intellect_1	-.010	.108	-.111	-.130	-.105	.631	.064	-.071
TechInteraction	.052	-.176	.082	.180	.094	.582	-.288	.008
TechTraining	.174	-.174	.092	.180	.098	.561	-.283	.189
Intellect_5	.198	-.020	-.226	.128	.063	.514	.078	-.096
Intellect_10	.072	-.153	-.304	.288	.167	.494	.127	.093
Streaming	.291	-.118	.120	-.065	-.020	.470	-.266	.291
TeachingTime	-.002	.012	.006	.026	.017	-.025	.812	.060
ProviderTime	-.108	.035	-.006	.038	-.013	-.040	.812	.128
Intellect_7	.060	-.047	-.099	.099	.200	.423	.443	-.013
Conscientiousness_8	.090	.125	.235	-.021	-.197	-.007	.135	.645
Agreeableness_3	-.029	.122	-.194	-.280	-.029	.136	.068	.469
Conscientiousness_4	-.064	.458	-.081	.179	-.156	-.002	.034	.465

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

APPENDIX F

Exploratory Factor Analysis IV (EFA-IV) Statistics

EFA-IV KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.723
Bartlett's Test of Sphericity	Approx. Chi-Square	2798.898
	df	820
	Sig.	<0.001

EFA-IV Parallel Analysis

Component	Eigenvalue of the actual data	Eigenvalue of the simulated data
1	6.262	2.375
2	4.290	2.183
3	3.210	2.010
4	3.019	1.936
5	2.635	1.837
6	2.132	1.747
7	1.771	1.685
8	**1.322**	**1.613**
9	1.258	1.547
10	1.131	1.480

EFA-IV Eigenvalues and Variance									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.262	15.273	15.273	6.262	15.273	15.273	5.743	14.007	14.007
2	4.290	10.464	25.737	4.290	10.464	25.737	4.051	9.879	23.886
3	3.210	7.830	33.566	3.210	7.830	33.566	3.145	7.671	31.557
4	3.019	7.363	40.930	3.019	7.363	40.930	2.954	7.204	38.761
5	2.635	6.426	47.356	2.635	6.426	47.356	2.954	7.204	45.965
6	2.132	5.200	52.556	2.132	5.200	52.556	2.245	5.475	51.440
7	1.771	4.319	56.874	1.771	4.319	56.874	2.228	5.434	56.874
8	1.322	3.224	60.098						
9	1.258	3.068	63.166						
10	1.131	2.758	65.924						
11	1.085	2.646	68.570						
12	.967	2.358	70.928						
13	.906	2.209	73.137						
14	.889	2.169	75.306						
15	.788	1.921	77.227						
16	.735	1.794	79.021						
17	.657	1.601	80.622						
18	.638	1.557	82.179						
19	.604	1.473	83.652						

EFA-IV Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	7
PU_1	.771	.021	.108	.040	-.005	.154	.095
PU_2	.787	.054	.145	.113	-.026	.106	.163
PU_3	.800	.065	.109	-.003	-.112	.109	.043
PU_4	.777	.053	.130	.089	-.141	.119	-.027
PEOU_1	.730	.016	-.008	-.077	.040	-.171	.075
PEOU_2	.669	-.133	-.037	-.188	.190	-.204	-.114
PEOU_3	.821	.034	.020	-.156	-.022	-.115	-.015
PEOU_4	.714	-.139	.066	-.096	.019	-.234	-.042
PeerVideoOp	.652	-.024	-.074	-.129	.310	.026	.284
PeerUseOp	.665	.012	-.091	-.088	.198	.079	.237
Stability_1	.011	.657	.141	.075	.163	-.159	.009
Stability_3	.030	.648	.128	.074	.225	.057	-.062
Stability_5	-.098	.591	.067	.031	-.145	-.176	.053
Stability_6	.099	.778	.006	.003	-.010	-.071	-.165
Stability_7	-.005	.680	-.084	.001	-.152	.093	.038
Stability_8	-.001	.616	-.003	-.023	-.125	.166	-.196
Stability_9	.043	.696	-.172	.115	.149	.208	-.076
Stability_10	-.045	.730	-.138	.102	-.113	.019	.022
Conscientiousness_1	.016	-.317	.091	.017	.532	-.118	.017
Conscientiouness_3	-.034	.062	.017	.028	.461	.375	.083
Conscientiousness_5	.038	-.140	-.026	-.125	.715	.062	-.153
Conscientiousness_7	.011	.148	-.012	.113	.696	-.115	.179
Conscientiousness_9	.086	.006	-.065	.057	.681	.024	-.028
Conscientiousness_10	-.002	.058	.164	.084	.635	.156	.108
Extraversion_2	.012	-.012	-.166	.749	-.034	-.083	-.010
Extraversion_4	-.007	.084	-.004	.793	.085	.117	-.039
Extraversion_6	.019	-.010	-.005	.753	.039	-.068	-.144
Extraversion_8	-.158	.113	.066	.603	.132	-.044	.065
Extraversion_10	-.177	.126	-.077	.759	-.088	-.018	.153
Agreeableness_2	.134	-.107	.569	-.179	.061	.046	.145
Agreeableness_4	.130	.038	.684	.029	-.013	.084	-.173
Agreeableness_6	-.097	.139	.720	.003	.005	-.125	.048
Agreeableness_8	.075	-.268	.662	.066	.034	.092	.177
Agreeableness_9	.015	.113	.826	-.037	-.173	-.009	-.017
Agreeableness_10	.090	-.051	.629	-.085	.274	.067	.052

EFA-IV Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	7
ProviderTime	-.104	.052	.021	-.037	-.037	.827	-.160
TeachingTime	.001	.034	.012	.000	-.014	.827	-.151
Intellect_7	.063	-.039	.108	-.108	.236	.506	.199
TechInteraction	.021	-.113	.146	.009	.078	-.040	.765
TechTraining	.142	-.111	.126	.008	.076	-.044	.777
Streaming	.263	-.050	-.114	-.009	-.037	-.056	.680

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

APPENDIX G

Exploratory Factor Analysis V (EFA-V) Statistics

EFA-V KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.731
Bartlett's Test of Sphericity	Approx. Chi-Square	2731.348
	df	780
	Sig.	<0.001

EFA-V Parallel Analysis		
Component	Eigenvalue of the actual data	Eigenvalue of the simulated data
1	6.236	2.330
2	4.288	2.152
3	3.136	2.026
4	3.019	1.910
5	2.576	1.825
6	2.102	1.747
7	1.708	1.680
8	**1.284**	**1.585**
9	1.241	1.536
10	1.102	1.472

EFA-V Eigenvalues and Variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.236	15.591	15.591	6.236	15.591	15.591	5.737	14.343	14.343
2	4.288	10.721	26.312	4.288	10.721	26.312	4.049	10.122	24.465
3	3.136	7.840	34.151	3.136	7.840	34.151	3.136	7.841	32.306
4	3.019	7.546	41.698	3.019	7.546	41.698	2.945	7.363	39.668
5	2.576	6.440	48.137	2.576	6.440	48.137	2.924	7.309	46.977
6	2.102	5.255	53.393	2.102	5.255	53.393	2.181	5.452	52.430
7	1.708	4.269	57.662	1.708	4.269	57.662	2.093	5.232	57.662
8	1.284	3.210	60.872						
9	1.241	3.103	63.975						
10	1.102	2.756	66.730						
11	1.085	2.711	69.442						
12	.967	2.416	71.858						
13	.892	2.230	74.087						
14	.838	2.096	76.183						
15	.746	1.865	78.048						
16	.671	1.678	79.726						
17	.638	1.596	81.322						
18	.607	1.516	82.838						
19	.579	1.447	84.285						

EFA-V Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
PU_1	.773	.020	.110	.042	.000	.083	.118
PU_2	.788	.054	.147	.111	-.018	.165	.095
PU_3	.801	.065	.111	-.006	-.101	.050	.116
PU_4	.777	.053	.131	.087	-.132	-.019	.129
PEOU_1	.727	.016	-.011	-.079	.030	.083	-.158
PEOU_2	.668	-.134	-.040	-.186	.174	-.123	-.218
PEOU_3	.820	.034	.018	-.156	-.030	-.015	-.113
PEOU_4	.713	-.138	.065	-.092	.001	-.058	-.250
PeerVideoOp	.652	-.026	-.073	-.132	.315	.285	-.001
PeerUseOp	.666	.011	-.089	-.088	.202	.229	.039
Stability_1	.009	.657	.136	.076	.153	.013	-.156
Stability_3	.028	.646	.126	.065	.237	-.029	.096
Stability_5	-.100	.592	.064	.031	-.152	.058	-.150
Stability_6	.098	.778	.006	-.001	-.005	-.150	-.031
Stability_7	-.003	.680	-.081	.005	-.145	.021	.072
Stability_8	.001	.615	.002	-.022	-.113	-.208	.156
Stability_9	.045	.694	-.169	.115	.162	-.083	.185
Stability_10	-.043	.730	-.136	.106	-.111	.004	.001
Conscientiousness_1	.016	-.320	.090	.019	.522	.001	-.165
Conscientiouness_3	-.028	.058	.025	.028	.485	.064	.302
Conscientiousness_5	.037	-.145	-.026	-.134	.723	-.133	.059
Conscientiousness_7	.011	.145	-.013	.113	.689	.168	-.166
Conscientiousness_9	.084	.002	-.068	.051	.683	-.008	.016
Conscientiousness_10	.002	.053	.169	.085	.646	.089	.083
Extraversion_2	.013	-.011	-.168	.757	-.047	-.036	-.111
Extraversion_4	-.007	.083	-.003	.790	.097	-.030	.131
Extraversion_6	.018	-.010	-.006	.753	.035	-.142	-.050
Extraversion_8	-.158	.113	.064	.600	.133	.075	-.028
Extraversion_10	-.177	.127	-.077	.757	-.081	.159	.007
Agreeableness_2	.133	-.107	.569	-.180	.063	.152	.035
Agreeableness_4	.131	.037	.687	.030	-.009	-.178	.073
Agreeableness_6	-.097	.139	.720	.007	-.003	.033	-.147
Agreeableness_8	.074	-.269	.663	.062	.043	.190	.093
Agreeableness_9	.014	.114	.826	-.039	-.170	-.007	.010
Agreeableness_10	.091	-.052	.629	-.081	.268	.038	.008

TechInteraction	.021	-.113	.144	.008	.078	.767	-.071
TechTraining	.142	-.110	.125	.006	.079	.781	-.068
Streaming	.262	-.049	-.115	-.014	-.030	.695	-.047
TeachingTime	.003	.031	.020	-.018	.047	-.091	.879
ProviderTime	-.102	.049	.029	-.054	.023	-.105	.872

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

APPENDIX H

Path Weights

	PU	ST	AG	EX	CO	TC	PE
PU_1	0.792						
PU_2	0.801						
PU_3	0.805						
PU_4	0.757						
PEOU_1	0.724						
PEOU_2	0.659						
PEOU_3	0.822						
PEOU_4	0.723						
PeerVideoOp	0.698						
PeerUseOp	0.688						
Stability_1		0.692					
Stability_3		0.769					
Stability_5		0.426					
Stability_6		0.583					
Stability_7		0.427					
Stability_8		0.014					
Stability_9		0.649					
Stability_10		0.514					
Agreeableness_2			0.611				
Agreeableness_4			0.684				
Agreeableness_6			0.691				

	PU	ST	AG	EX	CO	TC	PE
Agreeableness_8			0.630				
Agreeableness_9			0.782				
Agreeableness_10			0.753				
Extraversion_2				0.617			
Extraversion_4				0.554			
Extraversion_6				0.605			
Extraversion_8				0.900			
Extraversion_10				0.695			
Conscientiousness_1					0.298		
Conscientiousness_3					0.238		
Concientiousness_5					0.655		
Conscientiousness_7					0.811		
Conscientiouness_9					0.722		
Conscientiousness_10					0.655		
TechInteraction						0.773	
TechTraining						0.852	
Streaming						0.806	
TeachingTime							0.362
ProviderTime							0.399

APPENDIX I

Recruitment Email

Survey of EMS Educators Intention to Use and Behavioral Use of video cases of actual patient encounters (ReelDX)

I am writing to request your participation in a brief survey. The survey is designed to collect information on factors that may impact EMS Educator intention to use or use of videos of actual patient encounters.

Study participants will include academic professionals who are currently working with or teaching for an accredited prehospital EMS education program and are involved in the design or instruction of curriculum. Participants will hold at least one credential that renders them as qualified educators such as state and/or national Paramedic, state and/or national EMS instructor, Registered Nurse (RN), Physician Assistant (PA), Doctor of Osteopathic medicine (DO), and/or Doctor of Medicine (MD).

The survey is brief and should take no more than 15 minutes to complete. Please click the link below to access the survey (or copy and paste the link into your Internet browser).

Your participation in the survey is voluntary and your responses will be kept confidential. No personally identifiable information will be associated with your responses in any reporting of the results. The Boise State University Institutional Review Board has approved this study and survey.

Should you have any comments or questions, please feel free to contact me at

________________________________ .

Thank you for your time and cooperation. EMS research and education is important to continuing the forward movement of the profession.