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The Effectiveness of E-Learning Safety Education on Safety Behavior from the Perspective of Protection Motivation Theory: A Conceptual Approach

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Abstract. The purpose of the study is to evaluate the effectiveness of E-Learning Safety Education on Safety Behavior from the perspective of Protection Motivation Theory. Several Effective E-Learning Safety Education antecedents, such as E-Learning format characteristics, technology characteristics, and instructor- and learner-related factors, are proposed, with implications for safety behavior. The relationship between these characteristics and safety behavior designs is observed within the Protection Motivation Theory framework that deals with threat and coping appraisal with the implication of improved Safety Behavior. A proposed theoretical framework could provide insight into E-Learning's potential to enhance safety behavior across different sectors.

Keywords: Emotional exhaustion, Job satisfaction, Kosovo, Primary education, Teacher strikes, Work experience.

1. INRTODUCTION

To ensure that safe behavior is firmly embedded within the system, it is essential to provide comprehensive safety education. Furthermore, it assists in preventing accidents in domestic, occupational, and public settings (Edmondson & Bransby, 2023; Muduli & Sinha, 2021; Soliman et al., 2024). The goal is to increase awareness, recognition, and competence in risk control, hazard analysis, and safety measures (Landry et al., 2021). When safety education is conducted effectively, individuals are empowered with the necessary skills and knowledge to make decisions and take actions that would help protect themselves and the entire environment (Chen, 2020)

Today, E-Learning is considered a valuable process for extending safety education to a larger audience. The effectiveness and coverage are high, making it more beneficial than traditional training. The benefits include but are not limited to, ease of use, accessibility, and interactive multimedia content (Abogamous, 2022; Rasjid et al., 2023). Effective E-Learning safety programs provide appropriate safety instruction, risk management, and assessment of hazardous situations, allowing people to learn relevant skills and knowledge to practice safe behaviors (Kapo et al., 2024; Kim & Chung, 2023; Rasjid et al., 2023). The Campbell Institute (2017) mentioned that Protection Motivation Theory (PMT) provides a practical framework to understand safety behavior, in which an individual's safety behavior depends on their perception of threat and whether they can address it. These perceptions drive their cognitive factor on how they respond to threats. The PMT can function as a tool for experts to design and implement E-Learning programs that promote and achieve safe behavior.

Although several previous studies have examined the effectiveness of E-Learning in safety education (Bhute et al., 2021; Kim & Chung, 2023), not so much is known about the underlying mechanism behind E-Learning Safety Education, especially how it affects Safety Behavior. By integrating PMT, the study could provide a more comprehensive understanding of the impact of these digital learning programs on safety-related attitudes, intentions, and behaviors.

The article is structured into five sections to explain and ensure a comprehensive exploration of how the E-Learning Effectiveness antecedences affect E-Learning Safety Behavior. Section 1 provides background and gaps in the research and why the study used the PMT to explore the relationship between E-E-Learning education and safety attitude, intention, and behavior. Section 2 provides a detailed overview of the relevant literature, highlighting key studies and their contributions, especially in E-Learning Effectiveness, PMT, and Safety Behavior. Section 3 outlines the methodology employed, describing the research design, data collection, and analytical techniques. Section 4 presents the results of the study and discusses how each of the E-Learning antecedences can effectively affect the threat and coping appraisal that influences Safety Behavior. Finally, Section 5 concludes the paper with a summary of key insights, implications for practice, and suggestions for future research.

2. LITERATURE REVIEW

2.1. E-Learning Effectiveness

E-Learning adoption demonstrated a notable upward trajectory, especially due to the technological advancements accelerated by the pandemic. This digital learning platform has become increasingly sophisticated as people connect from anywhere, anytime, without any boundaries. As a result, in most contexts, people perceive E-Learning as a more accessible and straightforward approach (Kapo et al., 2024). Many educational institutions have begun adopting E-Learning in the context of safety education due to their capabilities, which have advanced safety education due to their advantages. E-learning has several advantages over traditional, face-to-face

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education procedures. It facilitates multimedia interaction that provides more convenient usage and access that consequently can improve the comprehensiveness of safety procedures and measures (Al-Teete et al., 2023; Bhati et al., 2023). The design of E-Learning safety programs must be efficient and concise but should include the recognition of potential dangers with their avoidance methods and safety practices. Adopting E-Learning in safety education enables educational institutions and organizations to foster a robust safety culture and promote safe practices across various contexts.

Several studies have examined the impact of E-Learning. The study by Triyanto et al. (2024) argued that E-Learning effectiveness depends on three fundamental elements: pedagogy, evaluation, and technology. The technological dimension pertains to the design interface and the technology employed. The pedagogical level oversees the assessment of the learner's attitude and quality about the instructor and the learning process. The efficacy of E-Learning is contingent upon the intrinsic and extrinsic variables of students in higher education (Kapo et al., 2024). Intrinsic variables are internal and include knowledge sharing, self-efficacy, and personal innovation. The remaining facilitators, which allow students to remain motivated towards using the E-Learning platform, can be classified as extrinsic variables. These include the E-Learning systems, course content, teacher support, and institutions. However, according to Sorgenfrei & Smolnik (2016),moderating variables assist in analyzing E-Learning effectiveness. These include environmental dimensions, motivation, and cognitive dimensions.

Müller and Wulf (2020) posit that four parameters maintain a relationship and indicate the efficacy of E-Learning. These include technology, format, instructors, and learners. The technology features were established by combining Davis's (1985) Technology Adoption Model (TAM) and the (Goodhue & Thompson, 1995) Task-Technology Fit (TTF) model. The model comprises several constructions: task-technology fit, quality, richness, usefulness, ease of use, reliability, and playfulness. Considering the format features, blended learning encompasses both online and traditional face-to-face instruction. Such variables may include control, ease of use, usability, diversity analysis, learning climate, interaction, and flipped learning.

The instructor's features are contingent upon their designation, personality, and interactions with learners, among other factors. The instructor's attitude and level of control over technology are also considered. The instructor must interact with learners in a technological framework, employing communication, scaffolding, purposeful confusion strategies, feedback, and guidance for the audience. Additionally, learner features can help explain technology effectiveness. These features include earlier technological experience, anxiety about technology, academic performance, age, sex, emotions and motivation levels, reflection, and online activity types.

2.2. Protection Motivation Theory

As Rogers (1975) posited, the Protection Motivation Theory (PMT) represents a comprehensive model beyond merely conceptualizing specific cognitive and individual procedures that mobilize individuals to engage in protective activities. The fundamental premise of PMT is that two key variables influence an individual's safety behavior. First, the perceived severity of the threat must be considered, and second, the availability and efficacy of the coping mechanisms must be evaluated. Two aspects of threat perception can be identified: the estimated threat intensity (for example, a disaster) and the ability or strength to manage it. A distinction can be made between coping appraisal and resource assessment, the latter of which is present to manage the threat.

The cognitive procedures posited by PMT influence an individual's motivation and intention to implement protective measures, giving rise to safety behaviors. The UMT has been employed to examine a range of behaviors, including online risk-taking (Aurigemma et al., 2019), computer security (Haag et al., 2021), and health-protective behaviors (Razak et al., 2021). The research mentioned above enabled the validation of the PMT framework, thereby extending the explanations and predicting the behavior of individuals concerning safety across various sectors.

Nevertheless, the application of the PMT in the context of extending E-Learning safety education has yet to be subjected to rigorous assessment. Incorporating the PMT constructs into research and evaluation of safety behavior practices enables the identification of internal motivators that facilitate the implementation of protective behaviors across various sectors (Nouri et al., 2024). When this PMT is applied to safety-related matters, it promotes creating and enhancing interventions and programs designed to foster a safety culture and encourage safe behaviors (Faryabi et al., 2023).

Threat appraisal is the process of how individuals evaluate potential harm and threats related to their vulnerability (Walsh et al., 2022). It involves evaluating the level of severity and the likelihood that they are being affected. This threat appraisal might affect safety behavior in several ways. When individuals perceive that there are severe threats and believe that they are vulnerable, they are more likely to comply with safety regulations. The higher the risk perception, the more motivated they are to follow safety guidelines, which leads to risky behavior avoidance that might increase hazard exposure. The recognition of the seriousness of those threats encourages individuals to participate actively in a safety problem, even if they might voluntarily participate in safety committees or contribute to developing safety procedures. Individuals also will report unsafe conditions when they heighten the levels of threat that contribute to overall safety culture development through proactive communication. The high appraisal could lead to vigilante, which might reduce safety performance. The

detailed and carefully executed safety procedures will improve safety performance. Such a threatening situation has the potential to be overwhelming, which may result in feelings of anxiety or stress. The circumstances also will impede performance, given that fear and overthinking can have a detrimental impact on cognitive processes.

The conceptual framework offers a potential avenue for integrating the design of an E-Learning safety education program with the implementation of the Protection Motivation Theory. By this framework, the E-Learning safety education components should align with the PMT variables, such as the protection motivation incorporated into the cognitive individual process. In particular, the E-Learning strategy may affect the coping appraisal, threat appraisal, actions taken to ensure personal safety, and the actual behavior intended. As illustrated in Figure 1, the E-Learning-based model/scheme can encompass the E-Learning safety education and PMT core constructs, as previously outlined in the framework. This model demonstrates that through the strategic integration of E-Learning variables, it is feasible to influence coping appraisal, threat appraisal, and target safety behavior intent. The conceptual procedure enables the administration of digital interventions and the enhancement of commitment toward safety behavior among the target audience.

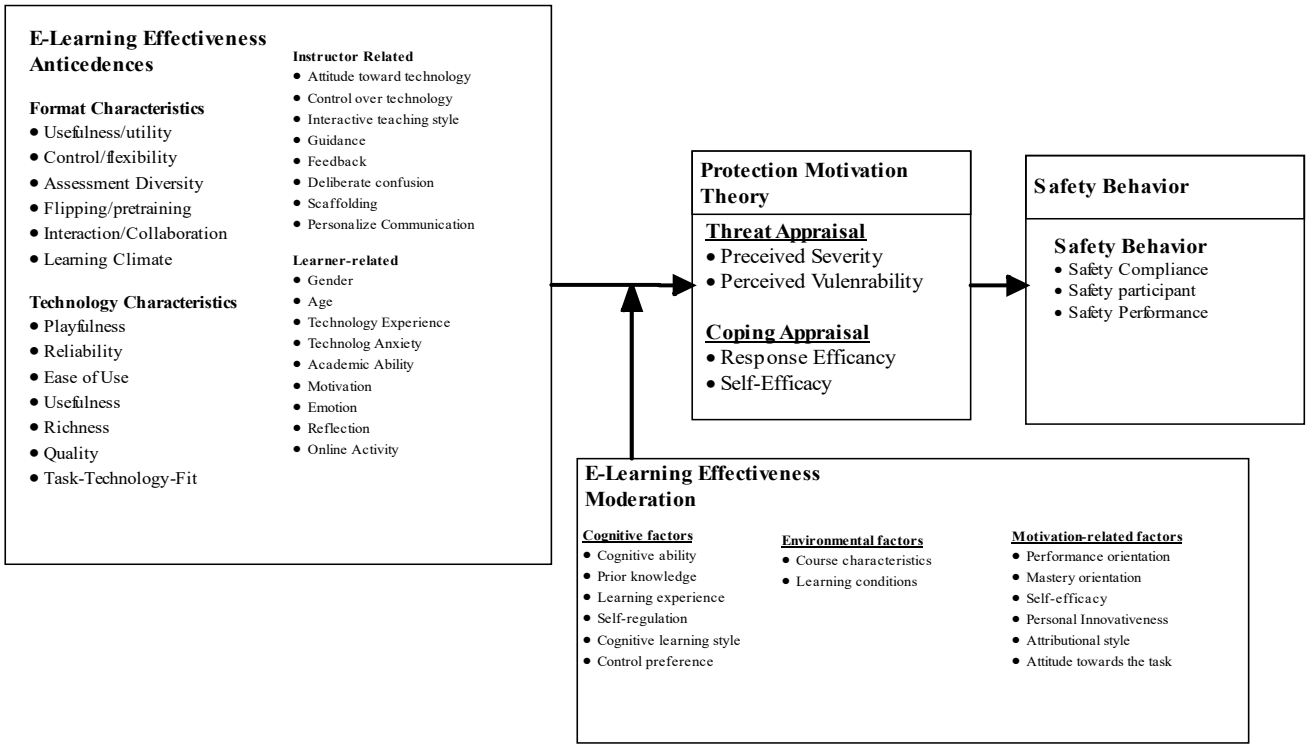

Figure 1: Proposed conceptual framework.

2.3. Safety Behavior

In the workplace context, environments prioritizing health, safety, and environmental (HSE) concerns must foster a culture of safety behavior to reduce the number of injuries and ensure the organization's continued well-being. Safety behavior can be classified into three distinct categories. The initial category is compliance, necessitating adherence to established policies, procedures, and safety regulations. Secondly, participation signifies engagement with safety-related elements or measures. Finally, performance refers to the efficiency of completing tasks to ensure employee safety. The two essential determinants of safety behavior are coping appraisal and threat appraisal. Such variables are referred to as psychological variables. The findings indicate that appraisals facilitate the management of specific safety behaviors and that organizations can implement measures to ensure a safe work environment.

For students, teachers, and administrators, safety behaviors inside and outside the school premises are of paramount importance, representing a crucial area of research. It is imperative to identify the measures that must be put in place to ensure the safety of both staff and students.

It is urgent and important to take all precautions to ensure student safety. This involves understanding the physical and psychological past that might harm them through safety research and implementing measures that might prevent those incidents.

The study by Sugai & Horner (2009) reveals that school-wide Positive Behavioral Interventions and Supports (SWPBIS) could motivate expected behavior through school-associated dynamic establishment. For example, there is a social-emotional learning (SEL) program implemented in 40 states throughout the United States that drives the growth of positive behavior by maintaining and organizing a positive learning environment. The study by Skoog-Hoffman et al. (2024) explored two types of safety: physical and psychological safety. These two types of safety have different purposes. In contrast, physical security has the purpose of eliminating violence through

threat assessment and protection procedures. Physiology safety has the purpose of mitigating bullying, abuse, or violence perpetrated by peers through the implementation of enhanced school environments and multi-level procedures.

Implementing safety protocols may have different impacts, depending on the context. Teacher-led initiatives through teacher Occupational Health and Safety (OHS) play a significant role in student safety behavior development (Y. C. Cheng, 1994). An instructor's position is crucial as they have the authority to make decisions and provide incentives to encourage their students to engage in safe behaviors at school. Moreover, Knowledge-Attitude-Behavior (KAB) models provide insight into students' safety-related behavioral decisions. It demonstrated that a student's knowledge and engagement have a positive relationship with occupational health and safety, and peer interactions also exert a considerable influence. The presence of supportive peers has been shown to encourage responsible behavior in students, especially in the laboratory environment, where specific consideration is required given the inherent risks involved. Integrating theoretical instruction with hands-on practice facilitates the learning process while ensuring that safety lessons are prioritized. It is possible to alter students' attitudes regarding the appropriate utilization of resources and materials in a laboratory setting by conducting experiments that expose them to risk while acquiring professional knowledge.

3. RESEARCH METHOD

This study might employ a quantitative, quasi-experimental research design to assess the effectiveness of E-Learning safety education on safety behavior from the perspective of Protection Motivation Theory. The study will involve control and intervention groups, with the intervention group receiving the E-Learning safety education program. Participants will be recruited from a target population of workers in a specific industry or organization. A random sampling technique will be used to ensure a representative sample. Power analysis will determine the sample size to provide sufficient statistical power. Data will be collected through self-report surveys administered multiple times, including pre-intervention, post-intervention, and follow-up assessments. The surveys will include validated measures of the PMT constructs (threat appraisal, coping appraisal, and behavioral intentions) and safety behavior. Additionally, usage data from the E-Learning platform will be collected to assess engagement and interaction with the program. The independent variable will be the E-Learning safety education program, the dependent variable will be self-reported safety behavior, and the mediating variables will be the PMT constructs (threat appraisal and coping appraisal). Data will be analyzed using structural equation modeling to test the hypothesized pathways between the E-Learning program, PMT constructs, and safety behavior. Mediation analysis will examine the PMT constructs' mediating role in the relationship between the E-Learning program and safety behavior.

4. DISCUSSION

The discussion will focus on four antecedent factor groups that determine the effectiveness of E-Learning. These include the format of E-Learning, the characteristics of enabling technology, and factors related to students and instructors.

4.1. The Relationship Between The E-Learning Format with Thread and Coping Appraisal

Learner perspectives on HES considerations are crucial in developing robust E-Learning programs. Perceived vulnerability refers to how individuals perceive themselves as at risk of a potential threat. Perceived severity refers to the degree to which an individual assesses the seriousness of a specific threat and its associated consequences. These perceptions can be influenced by how the content is designed, developed, and delivered, especially in relation to its format. The E-Learning format could influence the HSE's perceived vulnerability and severity in several ways: (1) E-Learning uses multimedia such as videos, animation, and simulation to illustrate realistic hazardous scenarios that have safety threats and consequences. This immersive technology can augment the learners' perception of threat severity in a more realistic way (Nurjaya et al., 2024; Scorgie et al., 2024); (2) E-Learning allows learners to control the speed of their studies using features like pausing, rewinding, and replaying the E-Learning content. It enables learners to process complex information related to HSE threats at their own pace more deeply (Zhao et al., 2021), which may strengthen awareness of potential hazards. (3) The E-Learning format can be in the form of Blended learning. It enables students to independently study and have critical thinking through case studies (Haftador et al., 2023). The Case study helps the learner analyze previous HSE situations and understand how to prevent and solve problems. (Gil-Quintana & Osuna-Acedo, 2020); (4) To recognize gaps, instruments like online assessments and quizzes enable learners to evaluate and highlight their understanding of HSE protocols and understand what they need to improve (Tran Minh et al., 2022); (5) The asynchronous nature of E-Learning formats enable learners with the time to reflect on HSE materials further. This reflection could lead to an increase in the awareness of personal susceptibility to threats as learners relate the content to their existing condition (Giesbers et al., 2014).

4.2. The Relationship between E-Learning Technology Factors with Thread and Coping Appraisal

E-Learning technologies enable interactivity, ubiquity, flexibility, and accessibility for knowledge

dissemination. High-fidelity simulation and immersive technology, such as virtual reality, can recreate realistic, hazardous situations that are emotionally engaging. It allows learners to witness the potential consequences of HSE threats without facing real physical risk (Birrenbach et al., 2021; Utomo et al., 2023). This immersive experience can increase the perceived severity by making the dangers more tangible, while emotions can reinforce the threat's seriousness. For example, videos showing the consequences of safety incidents can drive empathy and concern from the students and deepen the potential threat consequences.

E-learning interactivity is enabled by features like quizzes, situations, branch scenarios, and real-time discussions that engage the learner instead of just passively consuming content. Cross-platform compatibility across devices like computers, tablets, and smartphones enables continuous engagement, reinforcing the presence of HSE considerations in daily life (Jamaludin et al., 2024). Accessibility and ubiquity allow learners to access HSE content anytime and anywhere as long as they have an internet connection, making the material more relevant. It could also increase their personal vulnerability perception to threats.

Self-monitoring tools allow the learner to track their performance and learning behavior. They also allow learning gaps, allowing the learner to be more aware of their vulnerabilities. Technology allows benchmarking learning safety practices against peers, which will highlight the vulnerability gap that drives improvement. The collaboration features enabled by technology, e.g., online communities and forums, will facilitate discussion and let learners understand other learners' experiences on HSE Topics.

Collaboration features like online communities and forums facilitate discussions about HSE topics and let learners understand others' experiences with safety incidents, which also eventually increases awareness of potential vulnerabilities; collaborative projects on safety assessments or problem-solving tasks can reveal gaps in understanding, making individuals more conscious of their susceptibility to threats. Technology also enables self-management skills that affect coping appraisal by influencing learners' ability to access and engage effectively with the rest of the learners about the topic.

Proficiency in using E-Learning technologies allows learners to navigate platforms efficiently, enabling them to spend more time on learning content rather than dealing with technical issues. Technology user-friendliness will increase the learner's self-efficacy and allow the learner to allocate their cognitive resources to learn and master coping mechanisms rather than managing technical challenges.

4.3. The Relationship between Instructor and Learner Factors with Thread and Coping Appraisal

The environment built for Instructor-Learner interaction can significantly influence how learners perceive the severity of HSE threats and their danger. Understanding these influences is crucial for designing effective E-Learning strategies that enhance awareness and promote proactive safety behaviors.

In E-Learning, instructors play a significant role in impacting students' cognitive processes and attitudes. The study by Ramlatchan and Watson (2020) posits that instructors with expertise in HSE subjects can help learners internalize threats. When presented with realistic scenarios by more experienced instructors, potential hazard awareness increased. Proactive teachers can enable and facilitate a more interactive learning environment by actively participating in class discussions, providing feedback, and encouraging students to ask questions (Y. Cheng et al., 2022). The engagement will increase student awareness and can foster belonging and shared responsibility

Motivational factors, past knowledge, and self-efficacy influence the perception of the seriousness and vulnerability of HSE threats. Individuals who are motivated and have a profound personal interest in HSE topics are more likely to recognize the comprehensive scope of the subject matter, leading to an increased perception of the severity of potential dangers (Aboobaker & K.H., 2022). A learner with high motivation will demonstrate a high level of determination in their efforts to comprehend the various factors that contribute to the threat of inadequate safety measures. In contrast, learners with low motivation levels are more susceptible to threats due to their lack of comprehension regarding the level of HSE risks due to perceiving HSE issues as being of less significance than they are.

These sentiments also result from prior knowledge and experience with HSE, reinforcing this condition. Suppose they or an individual with whom they are acquainted has previously been involved in an accident. In that case, these learners may perceive themselves as more susceptible than others and thus attach greater significance to potential threats. This can be enhanced through E-Learning platforms, where students interact with one another and share personal experiences, thereby demonstrating the practical applicability of the course content in real-world scenarios. According to self-efficacy, which encompasses an individual's beliefs and perceptions regarding their ability to perform safety-related tasks, the perception of vulnerability may also be influenced. Although self-efficacy provides students with a secure environment to assess risk, it also diminishes their emotional vulnerability to potential threats. Consequently, many self-efficacious students may not perceive themselves as particularly vulnerable, given their belief in their capacity to exert control over the circumstances. Conversely, individuals with low self-efficacy may perceive the risks as alarming and ascribe a high vulnerability rating to themselves.

Learner-related elements, such as self-control and prior knowledge, significantly influence coping appraisal. A learner's capacity to organize, evaluate, and manage learning activities is defined as self-regulation. Regarding

formulating transparent learning objectives, determining optimal methodologies for instructional delivery, and evaluating the employed techniques, self-regulated learners demonstrate a capacity for self-direction. Those who adopt a proactive perspective also tend to exhibit higher levels of self-efficacy, believing they can learn and implement HSE measures, enhancing their coping appraisal. Furthermore, learners who employ effective learning techniques, such as summarizing and questioning, to enhance their comprehension of coping mechanisms demonstrate perseverance and determination in the face of adversity. This ensures a comprehensive understanding of safety precautions, ultimately enhancing their comfort level when implementing them. Moreover, providing a scaffold that facilitates the straightforward assimilation of new information allows the influence of existing knowledge on coping evaluation to be observed. As a result of their familiarity with the subject matter, these learners can rapidly assimilate new safety precautions, thereby enhancing their capacity to carry out the suggested activities. Moreover, their ability to apply previously acquired competencies in novel contexts enhances their capacity to manage a spectrum of HSE threats.

Instructor-related factors, such as experience and reflection, also significantly influence coping appraisal. Students who are encouraged to engage in planning and reflection or are compelled to engage in self-reflection are motivated to establish those deeper connections that facilitate the consideration of information and the evaluation of their skills. Learners reflect on their activities and understanding, identifying areas for improvement and formulating personalized coping strategies that align with their strengths and weaknesses. As a result, students become more responsible for their learning, facilitating their ability to adhere to safety regulations. Instructors with excellent knowledge can present information lucidly and emphatically, provide comprehensive explanations, and present realistic perspectives on how students might employ coping mechanisms. These instructors exemplify practical coping skills, which students are likely to emulate, and their specialization enhances credibility, increasing the likelihood that students will heed their suggestions and enhance their self-efficacy in coping strategies.

4.4. The Moderation Effect Factors

(Sorgenfrei & Smolnik, 2016) Proposed three moderating factors: Environmental factors, Motivation-related factors, and Cognitive factors. Cognitive factors include a person's capacity to regulate his/her learning and make the best decisions depending on the knowledge at hand. A person's interest in finishing the learning activities, his/her emphasis on the objectives, and his/her perception of ability to succeed in a task are all examples of motivating factors; the structure and content of the course are among the environmental factors.

4.5. Conceptual Framework

The conceptual framework proposes that the strategic integration of customized feedback, scenario-based simulations, and interactive multimedia can influence everyone's threat and coping appraisal processes. It is postulated that the E-Learning approach will enhance the perception of threat self-efficacy and vulnerability, thereby increasing the likelihood of adopting safety-related behaviors.

The conceptual model's findings indicate that utilizing E-Learning platforms tailored to the PMT framework is beneficial to delivering safety education to the target audience. This facilitates an increase in perceived threat severity and susceptibility levels, fosters positive attitudes toward safety practices, and encourages the adoption of protective safety behaviors.

Utilizing this intervention can promote theoretical perspectives on how to effectively encourage safety behavior via digital learning that integrates Protection Motivation Theory concepts. In terms of practice, the paradigm discussed here may inform the development and implementation of online safety education programs to foster a safety culture among the target audience.

The conceptual model further illustrates how the interactive multimedia material of the E-Learning tool and scenario-based simulations, along with individualized feedback, may facilitate a change in the assessment processes regarding an individual's risk and coping. It is hypothesized that the E-Learning approach will increase motivation and intentions to engage in protective behaviors when individuals have a more nuanced understanding of the following: the severity of threats, their perceived susceptibility to harm, the efficacy of their responses, and their self-efficacy. This model incorporates the PMT framework while addressing the challenges of creating visually appealing E-Learning components to bridge the gap between safety education initiatives and the target audience's protective behaviors.

5. CONCLUSION

In pursuing effective safety education, the proposed new framework in this study will integrate E-Learning principles with the Protection Motivation Theory (PMT), thereby providing a novel dimension to the field. The proposed framework will provide supplementary E-Learning resources, including case-based simulations, interactive multimedia, and customized feedback, to enhance people's motivation and intention to pursue safety-related action by integrating PMT threat assessment and coping appraisal models.

In future studies, the relationships between PMT, behavioral changes in safety, and E-Learning safety education should be subjected to objective evaluation to demonstrate that these tangible outcomes are applicable

in real-world contexts. Regarding E-Learning, the objective is to design and evaluate programs that will ultimately influence individuals' awareness of risks, their capacity to cope, and their security-related behaviors.

If the suggested conceptual model is experimentally validated, the efficacy of safety awareness programs is anticipated to be significantly increased. The combination of PMT and E-Learning offers safety experts and educators the potential to develop more engaging, tailored, and practical strategies to encourage the target audience to adhere to safety procedures with greater rigor. Conversely, this approach can potentially enhance the general level of safety and accountability among workers in each workplace.

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REFERENCES

Abogamous, A. H. R. (2022). A Theoretical Framework for the Adoption of Web-Based Learning Management Systems in Saudi Higher Educational Institution. *International Journal of Information and Education Technology*, *12*(7), 589–598. https://doi.org/10.18178/ijiet.2022.12.7.1658

Aboobaker, N., & K.H., M. (2022). Effectiveness of web-based learning environment: role of intrinsic learning motivation, computer self-efficacy, and learner engagement. *Development and Learning in Organizations: An International Journal*, *36*(4), 13–16. https://doi.org/10.1108/DLO-07-2021-0139

Al-Teete, R., Hassan, I. I., Abdul Kadir, A., & AbuAlRub, R. (2023). Nursing lecturers' perception toward E-learning approaches used in nursing colleges: Scoping review. *Journal of Professional Nursing*, *46*, 102–110. https://doi.org/10.1016/j.profnurs.2023.03.001

Aurigemma, S., Mattson, T., & Leonard, L. (2019). Evaluating the Core and Full Protection Motivation Theory Nomologies for the Voluntary Adoption of Password Manager Applications. *AIS Transactions on Replication Research*, *5*, 1–21. https://doi.org/10.17705/1atrr.00035

Bhati, N. S., Srivastava, S., & Rathore, J. S. (2023). Measurement of Doctoral Students' Intention to Use Online Learning: A SEM Approach Using the TRAM Model. *Journal of Information Technology Education: Innovations in Practice*, *22*, 179–200. https://doi.org/10.28945/5180

Bhute, V. J., Inguva, P., Shah, U., & Brechtelsbauer, C. (2021). Transforming traditional teaching laboratories for effective remote delivery—A review. *Education for Chemical Engineers*, *35*, 96–104. https://doi.org/10.1016/j.ece.2021.01.008

Birrenbach, T., Zbinden, J., Papagiannakis, G., Exadaktylos, A. K., Müller, M., Hautz, W. E., & Sauter, T. C. (2021). Effectiveness and Utility of Virtual Reality Simulation as an Educational Tool for Safe Performance of COVID-19 Diagnostics: Prospective, Randomized Pilot Trial. *JMIR Serious Games*, *9*(4), e29586. https://doi.org/10.2196/29586

Campbell Institute. (2017). *Risk Perception: Theories, Strategies, and next steps. Technical Report National Safety Council.* https://www.thecampbellinstitute.org/wp-content/uploads/2017/05/Campbell-Institute-Risk-Perception-WP.pdf

Chen, Y. (2020). Research and Practice of Fire Safety Education for Electrical Major Students in Higher Vocational Colleges. *Proceedings of the 6th International Conference on Humanities and Social Science Research (ICHSSR2020).* https://doi.org/10.2991/assehr.k.200428.115

Cheng, Y. C. (1994). Teacher Leadership Style: A Classroom-level Study. *Journal of Educational Administration*, *32*(3), 54–71. https://doi.org/10.1108/09578239410063111

Cheng, Y., Fang, S., & Yin, J. (2022). The effects of community safety support on COVID-19 event strength perception, risk perception, and health tourism intention: The moderating role of risk communication. *Managerial and Decision Economics*, *43*(2), 496–509. https://doi.org/10.1002/mde.3397

Edmondson, A. C., & Bransby, D. P. (2023). Psychological Safety Comes of Age: Observed Themes in an Established Literature. *Annual Review of Organizational Psychology and Organizational Behavior*, *10*(1), 55–78. https://doi.org/10.1146/annurev-orgpsych-120920-055217

Faryabi, R., Rezabeigi Davarani, F., Daneshi, S., & Moran, D. P. (2023). Investigating the effectiveness of protection motivation theory in predicting behaviors relating to natural disasters, in the households of southern Iran. *Frontiers in Public Health*, *11*. https://doi.org/10.3389/fpubh.2023.1201195

Giesbers, B., Rienties, B., Tempelaar, D., & Gijselaers, W. (2014). A dynamic analysis of the interplay between asynchronous and synchronous communication in online learning: The impact of motivation. *Journal of Computer Assisted Learning*, *30*(1), 30–50. https://doi.org/10.1111/jcal.12020

Gil-Quintana, J., & Osuna-Acedo, S. (2020). Citizenship Training through sMOOCs: A Participative and Intercreative Learning. *Sustainability*, *12*(20), 8301. https://doi.org/10.3390/su12208301

Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*, *19*(2), 213. https://doi.org/10.2307/249689

Haag, S., Siponen, M., & Liu, F. (2021). Protection Motivation Theory in Information Systems Security Research. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *52*(2), 25–67. https://doi.org/10.1145/3462766.3462770

Haftador, A. M., Tehranineshat, B., Keshtkaran, Z., & Mohebbi, Z. (2023). A study of the effects of blended learning on university students' critical thinking: A systematic review. *Journal of Education and Health Promotion*, *12*(1). https://doi.org/10.4103/jehp.jehp_665_22

Kapo, A., Milutinovic, L. D., Rakovic, L., & Maric, S. (2024). Enhancing e-learning effectiveness: analyzing extrinsic and intrinsic factors influencing students' use, learning, and performance in higher education. *Education and Information Technologies*, *29*(8), 10249–10276. https://doi.org/10.1007/s10639-023-12224-3

Kim, B. J., & Chung, J. B. (2023). Is safety education in the E-learning environment effective? Factors affecting the learning outcomes of online laboratory safety education. *Safety Science*, *168*. https://doi.org/10.1016/j.ssci.2023.106306

Landry, J., Ramos Velásquez, N. C., Bolaños Reyna, M. I., & Dixon, C. (2021). P4.014 A novel adolescent road traffic injury prevention engagement project. *Abstracts*, A71.2-A71. https://doi.org/10.1136/injuryprev-2021-safety.217

Muduli, A., & Sinha, S. (2021). Exploring the antecedents, drivers, and outcome of Behaviour-based safety: A literature review. *Psychology and Education Journal*, *58*(1), 5578–5581. https://doi.org/10.17762/pae.v58i1.2176

Müller, F. A., & Wulf, T. (2020). Technology-supported management education: a systematic review of antecedents of learning effectiveness. *International Journal of Educational Technology in Higher Education*, *17*(1). https://doi.org/10.1186/s41239-020-

00226-x

Nouri, M., Ghasemi, S., Dabaghi, S., & Sarbakhsh, P. (2024). The effects of an educational intervention based on the protection motivation theory on the protective behaviors of emergency ward nurses against occupational hazards: a quasi-experimental study. *BMC Nursing*, *23*(1), 409. https://doi.org/10.1186/s12912-024-02053-1

Nurjaya, Maulana, Y., Maulida, I. S., Bakri, & Antonia Junianty Laratmase. (2024). The Impact of Multimedia Elements on Tablets and Digital Stories in Learning Process Management. *Journal of Education Technology*, *8*(1), 136–146. https://doi.org/10.23887/jet.v8i1.71326

Ramlatchan, M., & Watson, G. S. (2020). Enhancing instructor credibility and immediacy in online multimedia designs. *Educational Technology Research and Development*, *68*(1), 511–528. https://doi.org/10.1007/s11423-019-09714-y

Rasjid, A. R., Al Yakin, A., Muthmainnah, M., & Obaid, A. J. (2023). Exploring Students' Autonomous Learning Behaviours Toward E-Learning to Higher Education Performance. *AL-ISHLAH: Jurnal Pendidikan*, *15*(2), 2551–2561. https://doi.org/10.35445/alishlah.v15i2.1449

Razak, N. A., Marmaya, N. H., Wee, N. M. M. F., Sadik, M. Z., Juhari, J., & Harun, H. (2021). Protection Motivation Theory and Skincare Risks: The Role of Social Influence towards Purchasing Intentions of Local Cosmetic Products. *International Journal of Academic Research in Business and Social Sciences*, *11*(11). https://doi.org/10.6007/IJARBSS/v11-i11/11615

Rogers, R. W. (1975). A Protection Motivation Theory of Fear Appeals and Attitude Change1. *The Journal of Psychology*, *91*(1), 93–114. https://doi.org/10.1080/00223980.1975.9915803

Scorgie, D., Feng, Z., Paes, D., Parisi, F., Yiu, T. W., & Lovreglio, R. (2024). Virtual reality for safety training: A systematic literature review and meta-analysis. *Safety Science*, *171*, 106372. https://doi.org/10.1016/j.ssci.2023.106372

Skoog-Hoffman, A., Miller, A. A., Plate, R. C., Meyers, D. C., Tucker, A. S., Meyers, G., Diliberti, M. K., Schwartz, H. L., Kuhfeld, M., Jagers, R. J., Steele, L., & Schlund, J. (2024). *Social and Emotional Learning in U.S. Schools: Findings from CASEL's Nationwide Policy Scan and the American Teacher Panel and American School Leader Panel Surveys*.

Soliman, M., Gulvady, S., Elbaz, A. M., Mosbah, M., & Wahba, M. S. (2024). Robot-delivered tourism and hospitality services: How to evaluate the impact of health and safety considerations on visitors' satisfaction and loyalty? *Tourism and Hospitality Research*, *24*(3), 393–409. https://doi.org/10.1177/14673584231153367

Sorgenfrei, C., & Smolnik, S. (2016). The Effectiveness of E-Learning Systems: A Review of the Empirical Literature on Learner Control. In *Decision Sciences Journal of Innovative Education* (Vol. 14, Issue 2). https://doi.org/10.1111/(ISSN)1540-4609

Sugai, G., & Horner, R. H. (2009). *Defining and Describing Schoolwide Positive Behavior Support* (pp. 307–326). https://doi.org/10.1007/978-0-387-09632-2_13

Tran Minh, M., Tamminen, M., Tamminen-Sirkiä, J., Majumder, M. M., Tabassum, R., & Lahti, T. (2022). Quantitative online survey of self-perceived knowledge and knowledge gaps of medicines research and development among Finnish general public. *BMJ Open*, *12*(5), e053693. https://doi.org/10.1136/bmjopen-2021-053693

Triyanto, T., Kholifah, N., Nurtanto, M., Nur, H. R., Saputro, I. N., Istanti, H. N., & Gadi, A. C. Z. (2024). Student e-learning effectiveness based on pedagogy, evaluation and technology dimensions (PET-D): Empirical studies in higher education in the COVID-19 epidemic. *Multidisciplinary Science Journal*, *6*(12). https://doi.org/10.31893/multiscience.2024245

Utomo, P., Cham, T.-H., Pek, C.-K., & Mamatkulov, S. (2023). Deep Dive into the Augmented Reality Customer Experience and Adoption Research: A Bibliometric Study. In M. A. Al-Sharafi, M. Al-Emran, G. W.-H. Tan, & K.-B. Ooi (Eds.), *Current and Future Trends on Intelligent Technology Adoption. Studies in Computational Intelligence vol 1128* (pp. 413–433). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-48397-4_21

Walsh, K., Pink, E., Ayling, N., Sondergeld, A., Dallaston, E., Tournas, P., Serry, E., Trotter, S., Spanos, T., & Rogic, N. (2022). Best Practice Framework for Online Safety Education: Results from a rapid review of the international literature, expert review, and stakeholder consultation. *International Journal of Child-Computer Interaction*, *33*. https://doi.org/10.1016/j.ijcci.2022.100474

Zhao, Y., Pinto Llorente, A. M., & Sánchez Gómez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, *168*, 104212. https://doi.org/10.1016/j.compedu.2021.104212