Commercialization Plan

CP1. Value of the SBIR/STTR Project, Expected Outcomes, and Impact. d'Vinci Interactive (**d'Vinci**), in collaboration with The Penn State College of Medicine (**PSCOM**), plans to serve Mandated Reporters (**MRs**) and their member organizations with the ***Beacon of Child Safety*** (***"Beacon"***), an online educational solution to provide **scalable, evidence-based MR training (MRT) to individuals, states, and organizations across the country**. *Beacon* will be the first online evidence-based mandated reporting (**MR**) certification course capable of meeting the requirements of all 50 states. This innovative educational solution will help learners and organizations address critical concerns related to marginalized groups, including highlighting how implicit bias and structural racism often impact MR practices.[1,2]

The disastrous effects of child maltreatment (**CM**, ie, physical, sexual, and emotional abuse, and neglect), and its long-term consequences are major public health problems that call for a more comprehensive online solution to educate, inform, and certify MRs. Built with support from multiple NICHD research grants, the *PSCOM iLookOut*'s MR Core Training has been shown (in both "Real World" and Randomized Controlled Trials) to significantly improve knowledge and attitudes about child abuse and its reporting. Designed to ensure that all professionals can master basic information about how to identify signs of CM, the *iLookOut* training provides instructional activities along with various didactic exercises and resource handouts, requiring learners to master the learning objectives. The *iLookOut* content prepares MRs to meet their professional, ethical, and legal responsibilities for identifying and reporting suspected child abuse, helping learners both acquire and operationalize knowledge that can help protect real children from harm.

The *d'Vinci* and PSCOM teams will reimagine, modernize, and expand the previously developed *iLookOut for Child Abuse* training to prepare MRs nationwide to identify signs of CM and know how, what, and when to report. The *Beacon* training will also help learners become more reflective about factors that influence perceptions and judgments about at-risk children and their families, including assessing (pre/post-training) a learner's ability to identify racial, ethnic, and class-based bias related to CM reporting. MRs and the organizations that employ them need an effective online training solution to prepare them to protect children. It is vital they have access to a cohesive curriculum that is evidence-based and provides an engaging, cutting-edge learning experience to ensure knowledge transfer and retention.

The *Beacon* solution will benefit society by promoting more effective and equitable outcomes for at-risk children and their families by preparing childcare professionals, teachers, social workers, healthcare providers, coaches, community volunteers, law enforcement, and other MRs nationwide to both identify signs of CM and understand what, when, and how to report. *Beacon* aims to have both **motivational** and **transformative impact** on MRs' understanding and critical thinking regarding CM, their ability to effectively report suspected CM, and their preparedness to support at-risk children and their families. In doing so, *Beacon* will help better protect at-risk children —especially those who suffer in silence– and lower the likelihood of unwarranted targeting of families struggling with poverty.

The main challenges we aim to address include the various complexities of identifying CM, the significant inequalities in CM reporting, the conflation of *poverty* with *neglect,* implicit biases (eg, race, socioeconomic status) that lead to disproportionate targeting of marginalized communities,[3,4] both over-and under-reporting; large variability in state MR requirements, substantiation rates of just 20%,[2] and unengaging MR training (**MRT**). *Beacon* will address these challenges by creating an expanded technical solution delivered in an innovative format that combines the following key features:

- ***Evidence-Based Training Content.*** Built around critical thinking exercises and content from PSCOM's *iLookOut* course, *Beacon* will be the only evidence-based MRT solution available on the market for MR certification. *Beacon* training content will include topics such as understanding what reasonable suspicion means, collaborative approaches to support at-risk children, greater awareness of the lived experiences of marginalized communities, and strategies for reducing inappropriate and/or disproportionate reporting.
- ***State-Specific Training Content for all 50 US States.*** A robust relational database will track state-specific MRT requirements for all 50 US states, providing a state-specific training experience for all MRs. *Beacon* will also provide '**differential**' **trainings** that educate MRs who work in multiple states (eg, Red Cross workers, traveling nurses) about state-to-state differences to help ensure compliance with state regulations. An Application Programming Interface (**API**) will provide access to MR requirements in all 50 states within the larger *Beacon* ecosystem and serve as a reference for state regulators.

- ***Improved Decision-Making Abilities in MRs.*** The training will be very deliberate in its depiction of MRs, victims of CM, and other characters throughout its story-based scenarios, with inclusive learning materials and proven acceptability across a wide range of learners. Learners will be taught to **recognize potential bias involving class, race, ethnicity, gender, and disabilities as it applies to MRing,** along with strategies for improving their critical thinking skills**.** Learners will need to identify signs and symptoms of different types of CM, distinguish CM from other concerns (including poverty), and decide which steps to take, which may include reporting. This form of experiential learning will not only increase engagement but also expand measurable learning outcomes.
- ***Advanced MR Training Simulations.*** Interactive simulations (in *Beacon's* Advanced Training) will help motivate MRs to transition from engaged observers (in *Beacon's* Core Training) to primary decision-makers for realistic, challenging scenarios (in *Beacon's* Advanced Training). The simulations will serve as a capstone learning experience used to confirm prior learning and help learners more fully appreciate and relate to their real-world role protecting and supporting at-risk children and their families.
- ***High Learning Effectiveness.*** The learning experience will include diverse and relatable 3D/animated characters, scripted video scenarios, and gamified simulations of case-based challenges faced by MRs that heighten the realism of the scenarios. Diverse scenarios based on the actual experiences of MRs will be developed using peer-reviewed research. Examples of appropriate reporting of suspected CM, inappropriate reporting, and missed opportunities to protect children will be included. The simulations will require learners to assess others' decisions and then to be primary decision-makers for subsequent case scenarios.
- ***Administrative Features for Organizations.*** *Beacon* will provide training administrators with real-time access to tracking, monitoring, and certification of learner achievement, enabling administrators to manage organizational learning and compliance in real time. Administrators will also be able to manage 'differential' training that allows employees who work in multiple states to learn about differences in states' laws and policies. *Beacon* will also provide state regulators (eg, state agencies) certification of evidence-based training and ready access to changes in MR policy to stay informed on MR-related matters in other states.
- ***Multi-lingual Content:*** To further enhance our ability to reach and train learners from underrepresented groups, the Core MRT will be made available in a Spanish-language version. Additionally, the *Beacon* system will be built to support multiple languages based on market demand.

Learners will begin their MR certification journey by logging in and selecting the state where their employment and/or volunteer work requires them to be trained. The course content will then be dynamically customized to meet their state's specific MR requirements. After they launch the Core MRT, they will learn the types of CM and how to identify them. Interactive scenarios will challenge the learners to identify what is and is not CM. Learners will be prompted to consider potential unconscious biases that may influence their decisions, and will learn about stressors and risks that may factor into the occurrence of CM –such as substance use disorder, intimate partner violence, etc. After they complete the Core MRT, learners will gain access to the Advanced MRT, a highly immersive *capstone learning experience* where MRs take on a <u>first-person role</u> of assessing possible signs of CM in a safe, simulated environment.

d'Vinci plans to offer *Beacon* as an online subscription-based product for MRs such as early childhood educators, teachers and other school employees, youth-focused volunteer organizations, and a wide range of service professionals who interact with children. Additionally, an annual subscription will be offered for State Regulators to access *Beacon's* catalog of laws, policies, and MRT requirements for all 50 US states, and provide real-time updates/notification of any changes. The core revenue driver for the *Beacon* product will come from annual subscription purchases from individual MRs, group subscription purchases from institutions whose employees and volunteers are MRs, and State Regulators. The *Beacon* solution's planned launch is Fall of 2027, with pricing tiers shown in Table A. These pricing tiers have been determined based on a survey with comparable educational products, along with our conversations with potential institutional customers. In some states, learners may be able to access *Beacon* at no cost since the state government may fund access through a contract. We expect that Beacon's advanced features will motivate states to switch from their existing MRT options. But even for those that do not, we anticipate that a significant number of organizations, businesses, and individual MRs will be willing to pay for the enhanced features included in *Beacon*'s solution –similar to people's willingness to pay for subscription versions of products like LinkedIn or Dropbox (which have a free tier).

The proposed *Beacon* solution aligns with d'Vinci's business strategy to grow as a leading provider of online learning solutions and educational products. d'Vinci plans to grow by developing and distributing online

professional education, certification, and compliance solutions to individuals and institutions. The growth of the *Beacon* online certification product will contribute to our business goals and provide recurring, stable income from annual subscriptions that support company growth.

Table A: Overview of *Beacon* Price Tiers for Individual and Institutional Purchases

Tier	Features	Learner Accounts	Cost
Individual Learner Account	Full individual access	1	$24.99/annual
Group Purchases	Full access for small institutions. Incremental discounts are applied for every 100 individual users.	5-450	$14.99 per learner/annual
Tier 1 - Institutional Account	Same as above with multi-level administration and reporting capabilities.	451-1,000	$6,700/annual
Tier 2 - Institutional Account	Same as Tier 1	1,001-3,000	$10,000/annual
Tier 3 - Institutional Account	Same as Tier 1	3,001-6,000	$15,000/annual
Tier 4 - State and Enterprise Contracts	Same as Tier 1 plus modifications for administration and reporting across entities and different versions based on account type and custom integrations.	6,001-10,000	Custom Quote
Tier 5 - Large Organizations and Federal Entities	Same as Tier 4	>10,000	Custom Quote
State Regulator Account	Full access to 50 US states' MRT regulations and requirements, access to the **State Regulator Administrative Dashboard**, and set automatic updates to track any changes to laws and policy.	N/A	$1,500/annual

CP2. Company. Founded in 1994, d'Vinci is a privately held, certified small business that is recognized as a leader in creating engaging online learning experiences for adult and K-12 audiences. d'Vinci contracts with leading organizations to design and develop custom learning experiences, educational websites, and learning management applications that deliver them. Clients include federal and state government entities, mission-driven non-profits, professional associations, medical and educational institutions, and for-profit corporations.

Table B: Overview of d'Vinci Clients by Type

Category	Clients	Typical Applications
Federal and State Government Entities	National Institutes of Health National Human Genome Research Institute Northeast Counterdrug Training Center PA Department of Drug and Alcohol Programs PA Department of Military and Veterans Affairs	Educational websites, compliance-related online learning products, video training, educational apps, and learning management applications.
Non-Profits and Professional Associations	PBS Learning Media, Discovery Education, Sandy Hook Promise, SAE International, National Geographic, PA Council for Legal Education	K-12 learning experiences, educational websites, learning games, adult online learning, and video training. Learning management applications.
Medical and Educational Institutions	Penn State College of Medicine, The American Board of Pediatrics, Emmes	Educational products, custom learning solutions, adult online learning, maintenance of certification solutions, and learning management applications.
Corporations	Constellation Brands, Penske, StoneX, The Hershey Company, The Giant Company	Custom learning experiences and eLearning for sales, safety, compliance, and customer education.

d'Vinci's core competencies applied across all client types include curriculum development, eLearning module design and development, user experience/interface (UI/UX) design, 3D animation, educational

website development, product development, ecommerce integrations, product support and ongoing maintenance, accessibility, and 508 compliance. As a contractor, d'Vinci has led the design and technical delivery of human subject protection and other research-focused training for the NIH beginning in 1999 with the creation of the first digital human subjects protection training course for the NIH Office of Human Subject Research, Office of Extramural Research (OER), and Office of Intramural Research (OIR). Good Clinical Practice training courses were built for and are currently in use by the National Institute on Drug Abuse (NIDA). Additionally, d'Vinci has built a maintenance of certification (MOC) platform for the American Board of Pediatrics, which supports diplomates with innovative online training activities that are captured and submitted for certification.

Beyond providing services to clients under contracts, d'Vinci has also developed commercial products for the marketplace. d'Vinci's ecoLearn® learning management system (**LMS**) was originally developed 12 years ago and has been implemented for specific client requirements across a wide variety of applications, including law enforcement, compliance, certification, and sales training. d'Vinci developed and now delivers comprehensive services for the paid subscription educational product and compliance training product, Protecting Human Research Participants (**PHRP**), which serves individuals and institutions performing research involving human subjects. d'Vinci established the brand, designed the training, developed the website, learning management system, and ecommerce platform, and brought the solution to market. Since its inception in 2018, more than 100,000 learners have purchased and completed the training and earned certifications and continuing education credits. PHRP is available in English, Spanish, and French and can fulfill continuing education credit requirements across a variety of professions. d'Vinci has also developed *Blueprint of Life*, an online life sciences educational product funded by NIH SBIR Phase I and Phase II grant awards. *Blueprint of Life* teaches high school and college students about the importance of genomics in the future of health and personalized medicine. The project entered Phase III commercialization in the summer of 2024.

Company Commercialization History. d'Vinci Interactive has not received more than 15 SBIR Phase II awards from the Federal Government during the preceding 5 fiscal years.

Company Experience with MRT Solution Development. Currently, d'Vinci has a contract with PSCOM to host on ecoLearn® LMS the existing *iLookOut for Child Abuse* MRT for the state of Pennsylvania as well as the *iLookOut* course used to train Head Start employees nationwide. Both of these *iLookOut* courses are configured to capture and report specified data to the program researchers through foundational features in d'Vinci's ecoLearn® LMS, which will enable *Beacon* to connect, capture, and report data as described. PSCOM has also licensed all existing *iLookOut for Child Abuse* training materials to d'Vinci for commercial distribution. Among these materials are hour-long micro-learning courses on substance use disorder, intimate partner violence, adverse childhood experiences, and promoting resilience (which have been previously piloted in Maine as part of a prior NIH-sponsored iLookOut study). Table C shows PSCOM's and d'Vinci's experience developing training solutions for MRs and the prevention of CM.

Table C: Overview of PSCOM and d'Vinci experience with MRT/CM prevention solution development

PSCOM Team	d'Vinci Team	Joint Experience
15 years of experience	15 years of experience	
- Design and development of *iLookOut* for Child Abuse online MR training course. - Design and development of multiple advanced micro-learning modules (substance use disorder, intimate partner violence, adverse childhood experiences, and resilience). - Customized *iLookOut* versions for PA and ME. - PA's first online form for reporting suspected CM	- MR LMS for Dioceses of Harrisburg and Altoona - Educational website and learning activities for kids to prevent child sexual abuse SafeSecureKids.org with PA Coalition to Advance Respect (PCAR). - Responding to Victims of Trauma course for PA Chiefs of Police.	- *iLookOut* for Child Abuse PA MR training solution (for both PA and Head Start) using ecoLearn® LMS. - MR Academy commercial version of *iLookOut* for Child Abuse licensed from PSCOM by d'Vinci.

d'Vinci Team. The d'Vinci team is led by President and Principal Investigator Mason Scuderi, who has 25 years of educational technology experience. A d'Vinci leader since 1996, Mason oversees the day-to-day operations of the company and leads the management team. He will serve as PI/PD on this Fast-Track STTR project. Jenny Fedullo serves as the Director of Learning Experience at d'Vinci and brings over 10 years of experience leading teams in the creation of engaging online learning materials. In this Fast-Track STTR project, she will be responsible for overseeing the development of all *Beacon* learning experiences. Eric McDonald serves as the Director of Learning Technology and brings 25 years of experience with the company developing, hosting, and maintaining educational websites and web applications. In this Fast-Track STTR

project, he will be responsible for overseeing the design and development of the learning management platform and learning content delivery. Other team members who will contribute to this Phase II project include: (1) Jenica Jones (Senior eLearning Specialist) who brings instructional design experience and will work closely with Jenny Fedullo and the PSCOM team to write the curriculum and content for *Beacon* materials. (2) Jerry Bellew will serve as the Visual Design Director and will be responsible for visual aspects of the user experience, 3D/Animated character development, and creative treatments of all materials. (3) Grady Shingler serves as the 3D specialist for d'Vinci, designing and developing 3D assets, environments, and characters and will be primarily responsible for the animated character and setting designs and interactivity. (4) Wendi Swanson is a Senior Web Developer for d'Vinci and will be primarily responsible for programming the Learning Management Platform, Learner Portal, Regulator Notification Dashboard, and Administrative Dashboard. (5) Sally Reidy is the Educational Grant Specialist and will both provide content support and manage grant compliance and training. Sally has worked for d'Vinci for over 20 years, is highly experienced in adult education and served as Co-PI on d'Vinci's NIH SBIR Phase I and Phase II grant awards. (6) Katie Langan is the Quality and Support Specialist for d'Vinci and will be responsible primarily for quality assurance testing of all materials. ***Collaborators.*** The deep expertise of the d'Vinci team will be further supplemented by collaborations with prominent organizations and individuals in the educational space:

PSCOM's iLookOut Team. The PSCOM team is led by Benjamin H. Levi, MD, PhD, who will serve as co-PI on the project and will be responsible for leading the creation of educational content and support materials. Dr. Levi is highly experienced in MR education and certification, with over 20 years of experience in this field of work and has been PI or Co-PI on over $16M of grant-supported research. In addition to his seminal research about reasonable suspicion and mandated reporting, Dr. Levi has considerable experience with translation research –including creating Pennsylvania's first online form for reporting suspected CM; being the Founding Director of Penn State's Center for the Protection of Children; and being the primary architect and Director of the *iLookOut* for Child Abuse Project, which has provided MRT to >60,000 individuals in PA, ME, and Head Start programs nationwide. As Director of the *iLookOut* Project, Dr. Levi oversees 3 full-time staff as well as a larger group (n=10) of Co-Investigators across multiple institutions that includes research psychologists with expertise in early childhood trauma and promoting resilience (Dr. Kathryn Humphries, Vanderbilt Univ.), child welfare and self-regulation (Dr. Carlo Panlilio, Penn State), and human decision-making (Dr. Robb Hamm, Univ. of Oklahoma emeritus), as well as child protection regulation (Cathleen Palm, Center for Children's Justice).

The PSCOM team also includes Nicole Verdiglione, who is an experienced Research Associate with a demonstrated history of working on multiple NIH-sponsored research projects. Nicole is skilled in recruiting, curriculum development, a wide variety of administrative and data software programs, and data collection and analysis. Nicole is also a strong program and project management professional with 15 years of experience on >30 research trials and more than 10 years working on the *iLookOut* Project with Dr. Levi.

Under the leadership of the Co-PI Levi, the PSCOM team will be responsible for collaborating with d'Vinci on curriculum and content development and providing MR subject matter expertise. PSCOM will work closely with the d'Vinci team to oversee the translation of the legacy *iLookOut* curricula and other relevant content into engaging and interactive digital content for future learners. The PSCOM team will also serve as members of the design and testing teams and will contribute to the formative and summative evaluation process.

WestEd team. WestEd will serve as the research and evaluation partner for *Beacon*, conducting a series of formative and summative research studies to inform product development and to examine the promise of *Beacon*. The summative study of *Beacon* aims to understand the impact of this innovation training on learning outcomes for MRs. Using a blocked randomized controlled trial, this study will evaluate how completion of *Beacon* affects participant knowledge, attitudes, and biases compared to a Control group. The randomization of participants to Intervention and Control groups will permit the drawing of causal inferences concerning the impact of the training.[5] WestEd will be responsible for the recruiting study participants for both formative and summative testing of the prototype. (1) Andrew Grillo-Hill, PhD is a Senior Research Associate at WestEd's Science and Engineering team, who has worked extensively on formative and summative evaluations of technology use in K-12 classrooms. He is currently overseeing the research studies for several immersive virtual and augmented-reality educational products and a portfolio of STEM project evaluations funded by NSF, NASA, IES, and private foundations. (2) Ashley Boal, PhD is a Senior Research Associate in WestEd's Justice and Prevention area with over 10 years of experience conducting research and evaluation across a diverse range of content areas, including education, criminal justice, violence against women, and mental and physical health. Recently, Dr. Boal has led several projects focused on evaluating training and technical assistance programming for adult learners, including evaluations of training for law enforcement and educators.

Consultants. To operationalize and test awareness for implicit bias, we will work with Dr.Keith Payne (see LOS). For expert guidance on gamification for learning, we will continue to rely on Dr. Karl Kapp, a national expert who has been previously a part of the iLookOut team since its initial NIH funding in 2016. (see LOS).

Advisors. Jim Murphy (CEO, the National Association for Regulatory Administration, NARA), Kimberlee Belcher-Badal (Executive Director, National Workforce Registry Alliance), Roger A. Chatell (Boy Scouts of America Training Committee), Laurie Badzek, RN, JD, LLM (Dean of Nursing, Penn State), and Beth J. Shaw (Milton Hershey School, Executive Director, Student Support Services –see LOS.

Company Financials & Vision for the Future. d'Vinci Interactive, LLC has been in business for 30 years. In 2020, long-time d'Vinci executive leader, Mason Scuderi became president and acquired an equity stake. d'Vinci is financially healthy, consistently profitable, has cash reserves with no debt, and with the support of its parent company (JPL Integrated Communication) has experience managing complex multi-year contracts and grants of millions of dollars with sub-contractors and grant sub-awardees. As illustrated in Figure 1, d'Vinci is a revenue-generating business, with substantial potential for growth in the next 5 years. d'Vinci is ideally positioned to meet the critical management functions of the new *Beacon* educational product. Our experience designing, building, and launching similar product platforms for clients gives us all the capabilities required for success. As the *Beacon* product grows, we will scale with additional staff to focus solely on the success of the product. Our vision for *Beacon* is for it to integrate with a library of educational products that meet the safety and compliance needs of a growing customer base.
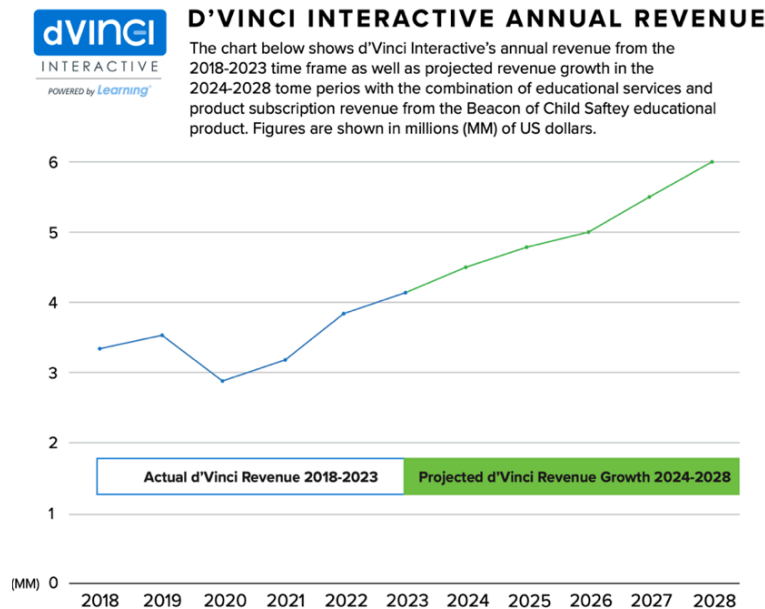

Figure 1. d'Vinci revenue stream and projected revenue

CP3. Market, Customer, and Competition. With the growing awareness and regulatory emphasis on child welfare and protection, the US market for high-quality MR training represents a compelling opportunity. The estimated population of professionals and volunteers who are MRs by law is well over 20 million Americans, including (among others) school employees, childcare providers, healthcare workers, law enforcement, social workers, and professionals and volunteers in non-profit youth organizations. MRT and MR certification is a growing market, with new populations of individuals being required to complete MRT. For example, in California, Assembly Bill (AB) 506 now requires youth service organizations to have their staff complete MRT in order for that organization to be insurable;[6,7] and nationally, improved MRT has been identified as a priority.[8] Moreover, the US Department of Health & Human Services and various state agencies require individuals in a multiplicity of roles to undergo training to identify and report CM –which creates a steady demand for comprehensive, accessible, and up-to-date training programs.

The online MRT currently available in the market is mostly substandard in terms of content interactivity, learner engagement, attention to disproportionality, and follow-up reinforcement (see *Significance)*. This leads to missed opportunities to prevent and report CM, as well as unwarranted reports that create hardships for many families and unnecessarily clog the child welfare system. Beyond the training itself, organizations are challenged with keeping MRT records for their employees and volunteers. This becomes even more difficult when they have people in multiple states with different MRT and compliance requirements. If audited, many organizations would find it difficult to demonstrate compliance even if most of their employees and volunteers had received training. Taken together, organizations nationwide are vulnerable to training gaps, leaving individuals who are mandatory reporters uncertified and/or unknowledgeable about how to identify and report suspected CM.

Individual MRs are also frustrated by low-quality MRT and inadequate administrative systems for record keeping.[9] In PA, the state-sponsored MRT involves static PowerPoint-like slides that cannot be advanced until 30 seconds have elapsed. So, too, MRs who work or volunteer in multiple states are required to take completely different MRT courses delivered in separate systems that do not communicate with each other.

Market Size. The market size for compliance training solutions is experiencing significant growth, with estimates of it reaching $3.8 billion by the timeframe for *Beacon's* launch in 2027, and $4.8 billion by 2030.[10]A

more aggressive report from Adroit Market Research (2021) projects $8 billion by 2028 due to 10.4% compound Annual Growth Rate for the eLearning segment of compliance training.[11]

Looking at just those who work childcare, elementary and primary education, and youth service non-profits, the number of MRs who require training is substantial. As of May 2021, over 8 million people are employed in elementary and secondary schools in the US (which includes teachers, principals, school nurses, school counselors, and others). In the US, there are over 634,000 childcare centers, employing ~1.5 million people,[12,13] and the ~15,000 youth service organizations in the US collectively employ ~400,000 people, and garner $25 billion in revenue annually. In just these 3 fields of work, there are also an estimated 5.5 million volunteers (who also require MRT). In just these 3 key market sectors, there are more than 15 million MRs.

Additionally, insurance companies and state governments are increasingly requiring organizations that work with children to ensure that their employees have completed CM and child sexual abuse prevention training and certification –with these specific training requirements sometimes being separate from state-specific training requirements. The *Beacon* program can become a comprehensive training solution that offers customized trainings that address insurance company requirements as well as the state-specific MRT requirements of customers and the organizations they insure.[14-17] For organizations whose employees and volunteers come in contact with children, the paramount factors when considering a solution for MRT are:

GLOBAL CORPORATE COMPLIANCE
TRAINING MARKET
USD 4.79 Billion
2025-2030 GROWTH
USD 2.91 Billion
2024
2030
Market forecast to grow at a CAGR of 8.6%

- ***Compliance***: The training must meet state and federal regulations, ensuring that MRs are compliant with legal requirements.
- ***Accessibility and Convenience***: Online or blended learning options that fit into professional schedules are highly valued, as is flexibility for when and where they can complete the training.
- ***Practicality and Relevance***: The training should be directly applicable to MRs' work environment, with real-life scenarios and case studies.
- ***Up-to-date Information***: As laws and best practices evolve, the training content must be current and reflect the latest standards and research.
- ***Certification and Accreditation***: Professionals often require proof of training, and certification that is recognized by employers and regulatory bodies is crucial.
- ***Cost-Effectiveness***: Budget constraints in certain sectors like education or non-profit organizations make affordable training solutions attractive.
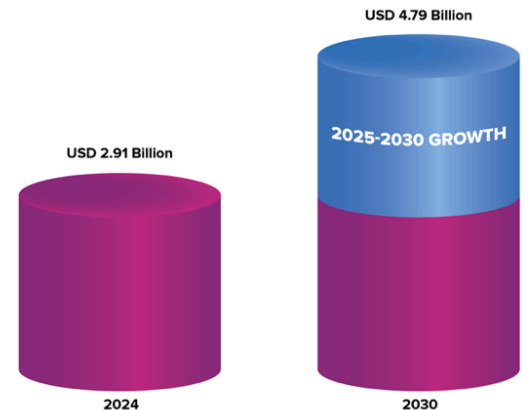
<u>Beacon</u> will address these needs and provide the most comprehensive solution in the marketplace.

Competition. Building a comprehensive online educational solution for MRT that can be utilized from anywhere in the US is a clear and important need. While there are many existing training and certification solutions available for MRs, they are <u>not</u> evidence-based, do <u>not</u> test learners' ability to identify implicit biases that could impact decisions to report CM, do <u>not</u> provide resources for ongoing training (eg, micro-learning), <u>lack</u> relatable characters and real-world scenarios, and have <u>minimal interactivity</u>.[18] Moreover, none can deliver online MRT and certification that meets the differing requirements of all 50 US states. Currently, most providers of MRT are either state-based platforms, government-provided entities, or commercial platforms.
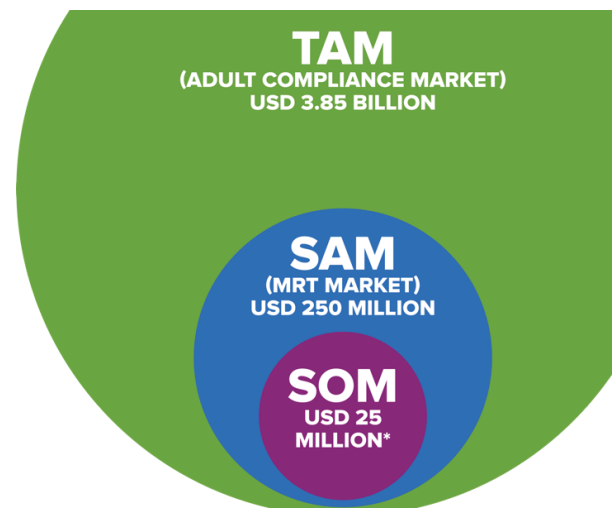

TAM
(ADULT COMPLIANCE MARKET)
USD 3.85 BILLION

SAM
(MRT MARKET)
USD 250 MILLION

SOM
USD 25 MILLION*

TAM = Total Addressable Market
SAM = Serviceable Available Market
SOM = Serviceable Obtainable Market

*10% Beacon Market Share

Examples of **state-based MRTs** are:

- <u>Recognizing and Reporting Child Abuse</u>–Sponsored by the University of Pittsburg and the PA Child Welfare Center, the eLearning course aligns with PA state MR training requirements and is free to PA state residents. https://www.reportabusepa.pitt.edu

- California MR Training with Simple LMS–MR online training for CA residents. Provides specific course content for different types of MR professionals and offers a Spanish language version. Cost is free for CA residents. https://www.mandatedreporterca.com

Examples of **commercial MRT** are:
- Compass Abuse Prevention Services–The Learning Factory LLC that delivers online CMprevention training for professionals and parents. The service includes a database of definitions of CM for all 50 states and provides a completion certificate for $10 per user seat. https://www.preventchildabusetraining.com
- MR Course–Udemy's platform that allows experts to build asynchronous eLearning courses and sell them, starting at $54.99 per month. https://www.udemy.com/course/mandated-reporter-training-c/

Table D provides an overview of how the above MRT products compare with the proposed *Beacon* solution.

Table D: Comparison of *Beacon* Solution with Other Online MRT Providers

Features	Compass	Udemy	Simple	*Beacon*
Level of Engagement[19]	Basic	Basic	Limited	Advanced
Content — Evidence-Based Methodology	–	–	–	√
Critical Thinking Exercises (for identification of *true* CM indicators and bias prevention)	–	–	–	√
Multi-Lingual Content	–	–	–	√
State-Specific Training Content for all 50 States	–	–	–	√
Interactive — 3D Animated, Customizable Characters	–	–	–	√
Personalized Learning Experience	√	–	–	√
Gamified, Immersive Case Simulations	√	–	–	√
Admin. — Learner Management & Progress Monitoring	√	√	–	√
Learner Statistics & Organizational Reporting	–	√	–	√
State MR Regulation Database (for regulators)	–	√	–	√

As illustrated above in Table D, these MRT products have deficiencies that prevent them from providing high-quality MRT in terms of both content and delivery. <u>*Content*</u>: Prior research demonstrates that the *iLookOut* training—which is the basis of *Beacon*'s curriculum—is considerably more robust than other MRTs.[18,19] While all approved MRTs include definitions of CM, legal responsibilities, and the mechanics of reporting suspected CM, the vast majority fail to address key issues such as: the relationship between CM and intimate partner violence or animal cruelty; observations and situations that should NOT raise concerns for abuse; or how MRs should (and should NOT) gather information.[18,19] Moreover, <u>none of the existing trainings are evidence-based</u> (ie, based on validated research), and none emphasize critical thinking.[19-22] *Beacon* is the only solution that will offer not only evidence-based MRT but also a strategy for learners to identify and counter implicit biases that could impact decisions about suspected CM. It will also be the only solution to provide online MRT and certification that can meet the differing requirements of all 50 US states. <u>*Interactive delivery*</u>: Most existing MRT solutions present information as a simple slideshow and/or video, with no (or very limited) interactive features. None offers the high level of interactivity, personalization, immersion, and engagement that *Beacon* will deliver.[18,19] Through a learning management platform, *Beacon* also will provide

administrative features for learner management and state regulation updates that make it unique. Overall, no competitor on the market offers the integrated combination of features proposed by *Beacon* —a value proposition expected to make *Beacon* an effective and highly desirable solution for MR learners, administrators, and regulators alike.

CP4. Intellectual Property (IP) Protection. The *Beacon* online educational solution will be the first MRT certification to provide **scalable, evidence-based MRT to individuals, states, and organizations across the country** compatible with all 50 states' MRT requirements. To protect the intellectual property, the product name will be registered with the US Patent and Trademark Office. A preliminary search revealed that *Beacon* is eligible for trademark protection as a website and online learning platform that administers educational instruction for MRT and certification. In addition, copyright protection will be secured for the content and interactive presentation embedded in the online learning platform; and d'Vinci already has in place an exclusive license with Penn State for all existing iLookOut content. The website and the embedded learning experiences will include copyright marks, and clear terms of use will be established to align with the access granted to the different levels of access. The primary domain BeaconofChildSafety.com and secondary domain BeaconofChildSafety.org have been purchased and prepared for use with the online product. Finally, immersive and interactive learning elements planned for our Phase II work (particularly the 50-state scaffolding) contain novel features that are potentially patentable, and for which d'Vinci will investigate patent protection.

CP5. Finance Plan. The *Beacon* online educational solution will be able to generate ongoing revenue through subscriptions at the end of our STTR Fast-track grant. As a consistently financially healthy company, d'Vinci can build on revenue generated by the *Beacon* products with other financing sources to further commercialization. These will include:

- Internal financing - d'Vinci can continue to invest a budgeted amount of labor and expertise to evolve and customize the *Beacon* product as well as provide technology infrastructure, initial sales, and technical support post-Phase II.
- Parent company financing - As one of the Northeast's largest integrated marketing agencies, d'Vinci's parent company, **JPL Integrated Communications, Inc.**, can provide strategic marketing and communications services at or below cost to support commercial growth post-Phase II.
- Bank financing - If needed for purchasing outside services, d'Vinci can access existing lines of credit through its primary banking relationships to finance outside marketing, subject matter expertise, and research that may be needed post-Phase II.
- Other financial investors - As *Beacon* and other d'Vinci products grow, d'Vinci may access growth capital from a financial investor such as private equity, venture capital, or other non-bank entities.
- Strategic partner(s) - d'Vinci can establish a partnership with an entity that is already marketing and selling complementary training platforms, such as Vector Solutions, Net CE, or Premiere Education to accelerate the adoption of *Beacon*.

CP6. Production and Marketing Plan. The *Beacon* go-to-market strategy will first target public and private schools, childcare centers, and youth servicing organizations. d'Vinci will develop the marketing plan in conjunction with advisors from each of these customer-type organizations. d'Vinci is currently assembling a board of advisors as well as a network of experts to support the implementation of d'Vinci's MR Academy product as well as the formation of the *Beacon* product. In the interim, d'Vinci has already established **MR Academy** will is using the *iLookOut* core MRT with none of the enhancements proposed in this STTR project (dashboards for organizations and regulators, highly immersive simulations, and multi-state and differential training). This more limited product recently went to market in Fall 2024 and includes an integrated marketing program to reach compliance training decision-makers in the same initial market as *Beacon*. During this interim phase, while *Beacon* is in development, d'Vinci will be gaining experience in the success of various marketing tactics to reach these decision-makers and convert them into customers. d'Vinci will also be building relationships with advisors, establishing a network of contacts and developing assets that can be modified to accommodate *Beacon*. To achieve wide adoption and commercial success, we will develop a comprehensive, integrated marketing strategy for *Beacon*. The goal of the strategy will be to build brand awareness with the largest number of organizations that employ MRs with the goal of enticing and converting a percentage of these entities to become paying subscribers. The

"The Boy Scouts of America is committed to joining a list of early adopters for Beacon of Child Safety and sees a clear need for the quality of training and administrative tools that Beacon will offer to meet the needs of Mandated Reporters."

Roger A. Chatell – Keystone Capital District Director and Staff Advisor - Training Committee
Boy Scouts of America

plan will evaluate and allocate resources among the following tactics:

- Search Engine Optimization - Ensure that *Beacon* ranks high in Google and other search engines for common search terms used by MRs.
- Social Media - Establish a YouTube channel with introductory and teaser videos that engage teachers and link them to the website. Use content on other social channels to engage teachers and students.
- Free Webinars - Demonstrate *Beacon's* features and how to integrate it into various curricula for prospective subscribers.
- Key Relationships - Proactively engage and develop relationships with key professional organizations such as the National Association for Regulatory Administration (see Murphy LOS) and National Workforce Registry Alliance (see Belcher-Badal LOS) as well as leaders in educational organizations like the School Superintendents Association, the National Child Care Association, and associations of youth-serving organizations like the Boy Scouts of America and the National Youth Sports Coaching Association. Feedback and potential endorsements from these leaders will provide credibility.
- Earned Media - Publicize the educational value and quality of *Beacon* through educational publications and websites that are widely read by targeted compliance training decision-makers. Also seek opportunities to earn awards and recognition for content quality and learning effectiveness.
- Professional Conference Presence - Present and/or sponsor and exhibit at conferences that are attended by compliance training decision-makers.
- eMail Marketing - Recruit compliance training decision-makers to register for email updates. Use email to build relationships with early customers and encourage referrals and upgrades. Strategically sponsor third-party emails that target prospective decision-makers.
- Paid Digital Media - As needed, buy and optimize Google Adwords terms that result in new customers. Use retargeting advertising tactics that reach targeted decision-makers on social media channels and websites.

"The Children's Advocacy Centers of Pennsylvania sees a clear need for the quality of training and administrative tools that Beacon of Child Safety could offer to meet the needs of Mandated Reporters and the organizations that employ them."

Rebecca Buckham
Children's Advocacy Centers of Pennsylvania

Table E: Go-to-Market Plan for Years 1-5

YEAR	TARGET MARKETS + PROD. FEATURES	GOALS	MARKETING/SALES ACTIVITIES
Year 1	- Target Markets: Childcare professionals, healthcare providers, teachers, social workers, coaches and community volunteers, law enforcement, and other MRs. - Product Features: Most popular free, entry-level curriculum and learning experiences. - Digital certificates demonstrating MR training certification status as well as badges recognizing successful achievement. - The most interactive and immersive online learning for MRT.	- Leverage the existing network of 60,000+ MR professionals associated with Penn State and iLookOut: Build targeted traffic to the website. Attract and engage MRs to access thought leadership materials and to sign up for an email newsletter. - Engage childcare centers and non-profits where initial interest has been strong to grow small institution uptake. - Build use by MRs in disadvantaged schools through the use of pilot tests with early adopters.	- Integrated marketing program that includes: • Free webinars • Paid search and Search Engine Optimization • Publicity in targeted publications and websites • email free-access users to promote paid subscriber features - Further, grow contacts within the Department of Defense (DoD) – which has expressed interest in the Core MRT.
Year 2	- Target Markets: Childcare centers, healthcare networks, school districts, non-profits, law enforcement organizations, and State and Federal Government, including the DoD. - (New) Product Features: More advanced features for institutional administrators, such as	- Develop success stories and relationships with key customers. - Gain childcare, healthcare, education, social work, volunteer, and law enforcement industry support. - (New) Product Features: Scalable administrative functionality to provide advanced reporting features.	- Continue integrated marketing program from the previous year, plus: - Establish presence at educational conferences. - Earn industry awards and recognitions. - Establish a sales team focused on institutional accounts and re-occurring licensing.

	assessments, monitoring, and reporting tools. - Live online demonstrations and webinars by leading industry and academic subject matter experts.	- API Integration with institutional Human Capital Management systems.	- Hire a Business Development manager to facilitate licensing partnerships.
Years 3-5	- Target Markets: Retain subscribing individuals and institutions. Add larger institutions, including Orange County Public Schools (FL), PA Department of Education, the National Association for Regulatory Administration, the YMCA, and Boy Scouts of America.	- Continue penetrating existing markets and expand into new ones. - Form partnerships and gain support from the state. - Pursue and win state-based request for proposal (RFP) opportunities to provide MR training to constituents.	Continue integrated marketing program from previous years, plus: • Expand Enterprise Sales team. • Expand Business Development team. • Implement cross-sell, upsell, and referral programs to boost Customer Lifetime Value.

Table E above illustrates the potential implementation of the marketing strategy, aligning the target markets, goals and activities, and tactics. Bringing *Beacon* to market is an opportunity to gain the attention of MRs, organizations, government agencies, and administrators who will be potential subscribers. To do so, we plan to utilize the following strategies, as well as leverage the partnerships shown in Table F.

- Pre-Launch Event - Approximately 6 weeks prior to the official launch, we will invite everyone involved in the project, members of the educational industry media, prominent leaders in child safety and other special guests to preview the site and its features. Ideally, this will be a live event that is webcast to those who are invited but cannot physically attend. This group would be granted access to *Beacon* prior to launch but would be discouraged from publishing about it until the official launch.
- Expert Involvement - Feature the credentials and credibility of those involved in the development of the product, including PSCOM's *iLookOut* team, WestEd, and d'Vinci, in addition to consultants from other notable educational, governmental, and industry experts.
- Preview Subscribers - Prior to the official launch, we will have seeded a number of public and private schools, childcare centers, and youth servicing organizations to help promote the high-quality content, learning experiences, and features available from *Beacon* on launch day.
- Official Launch Day - The goal for the official launch day of *Beacon* will be to have a combination of coverage by educational media, child welfare advocates, and local media in addition to organic social media posts and strategically placed digital advertisements. We would also plan emails to project stakeholders, initial subscribers, and other strategically targeted lists to gain initial engagement.

Table F: Planned Partnerships and Alliances for Product Commercialization

Organization	Name & Title	Assistance
The National Association for Regulatory Administration	Jim Murphy – CEO	Adopter & Advocate
The National Workforce Registry	Kimberlee Belcher-Badal, PhD – Executive Director	Adopter & Advocate
Milton Hershey School	Beth J. Shaw – Executive Director, Student Support Services	Early Adopter
Penn State University	Laurie Badzek, RN, JD, LLM – Dean of Nursing	Advisory
Boy Scouts of America	Roger A. Chatell – Keystone Capital District Director and Staff Advisor - Training Committee	Adopter & Advocate
Independent Consultant	Ken Burris – Former COO of the Federal Emergency Management Agency (FEMA)	Federal Government Capture
University of North Carolina	Keith Payne, PhD – Professor & Director of Graduate Studies	Consultant
Independent Consultant	Karl Kapp, EdD – Professor of Instructional Technology in Bloomsburg University's Department of Instructional Technology	Consultant

| U-GRO Daycare Centers | Greg Holsinger – Former CEO of U-GRO Daycare Centers | Advisory |

CP7. Revenue Stream. The *Beacon* product is planned to go to market in the Fall of 2028. We expect that it will take a couple of years to build a revenue stream from the product. Course samples will be made widely available for short-term demonstration accounts, and gathering feedback from early customers will put the educational solution in the best position to attract paid annual subscriptions. Following a formula we have successfully implemented in the past, d'Vinci aims to design, build, and commercialize a lucrative educational product by anticipating the educational needs of MRs, the organizations that employ them, and the institutions that oversee regulations. A preliminary projection of the gross revenues from the product uses $2,998 as the price per small institutional account (200 users), $6,700 as the starting price per tier 1 institutional account (with 451-1000 users), $10,000 as the starting price per tier 2 institutional account (1,001-3,000 users), $15,000 as the starting price per tier 3 institutional account (3,001-6,000 users), and $1500 for State Regulator accounts. We assume a 10% conversion rate from institutional-level sales inquiries, with a one-year decision time. We additionally assume a market share of roughly 10% at the end of Year 6 (2033). Based on these assumptions, revenue, and market share projections are shown in Table G below (understanding that market and revenue projections are always adapting to advances in technology as well as changes in society).

A secondary source of income (in addition to the individual purchases and annual institutional subscription revenue above) will be to utilize the *Beacon* learning content, technology, and team expertise to respond to US state-based RFP opportunities to provide MRT certification solutions. The d'Vinci and PSCOM teams have reviewed several similar RFP opportunities and believe *Beacon* would be a strong competitor to meet the needs of these state-based procurement opportunities. It is estimated that these additional contract awards could produce an additional $500,000 in revenue over a five-year period.

Table G: Revenue and Market Share Projections for the Years 2027-2032

YR	Individual Accounts	Individual Revenues	Institutional Account Revenues (T1-T5)	State Regulator Revenue	Market Size	Market Share	Revenue Total
2028	1,000	$24,990	$0	$3,000	$25,000,000	0.001%	$27,990
2029	5,000	$124,950	$6,700	$9,000	$26,000,000	0.05%	$140,650
2030	10,000	$249,900	$50,200	$18,000	$27,000,000	1%	$318,100
2031	30,000	$749,700	$260,400	$36,000	$28,000,000	4%	$1,046,100
2032	60,000	$1,499,400	$434,000	$48,000	$29,000,000	7%	$1,981,400
2033	80,000	$1,999,200	$797,500	$82,000	$30,000,000	10%	$2,878,700

Between new and recurring individual and institutional product subscription fees, subscriptions from state regulators, and contract awards from State, Federal, and larger institutional entities, the *Beacon* solution has substantial commercial potential in the growing market of online education and MRT certification solutions. Combined with the strong compliance and educational needs it fulfills, the capability to meet the MRT requirements of all 50 states, and the societal benefits it provides (particularly, more effective and equitable outcomes for at-risk children and their families and the mitigation of implicit bias and the impacts of structural racism often found in MR practices) the *Beacon* product is **well-positioned to positively contribute to improved educational and public health outcomes at the national level.**

CP8. Established Proof-of-Concept and Differentiation. The *Beacon* product will expand upon the iLookOut's evidence-based MRT, which in Randomized Controlled Trials has been shown to be superior to standard MRT. [21,22] In a nationwide study (forthcoming), Head Start staff (n=9,800) reported (on a 10-point scale, where 10=strongly agree) that iLookOut's MRT is easy to use (7.9), holds their interest (8.4), is useful for their role as MRs (9.0), presents information in a way that helped them learn (8.8), and that they would recommend it to others (8.7). Similar findings (for satisfaction and change in knowledge and attitudes) have been demonstrated (forthcoming) with healthcare professionals, law enforcement, educators, and other mandated reporters in Pennsylvania (n>20,000). Moreover, across multiple studies >90% of individuals who start the iLookOut MRT go on to complete the training. That said, **iLookOut's current MRT does NOT**

include a <u>relational database that can dynamically create MRT for other states</u>; it cannot create 'differential training' that enables learners to readily see how different states define CM and operationalize the various responsibilities of MRs; it does not <u>use realistic 3D imagery that has been designed and tested for relatability</u> across diverse audiences; it does not have <u>administrative dashboards for either institutions or regulators</u>; and it does not formally promote (or assess) <u>awareness of implicit bias</u> as it relates to perceptions of CM.

   The innovations that *Beacon* brings to the current iLookOut MRT will not only redress the above deficiencies, but transform MRT nationwide. By raising the bar for MRT, ensuring that high-quality MRT is readily available in all 50 states, and making it easy for people (including regulators and policy makers) to compare and contrast MR practices, *Beacon* has the potential to be truly transformative. By preparing MRs to accurately report children who genuinely need protection while also helping MRs avoid unwarranted reports that can harm families, *Beacon* can establish a national standard for both protecting children and supporting at-risk families. In doing so, scarce resources can be focused on those most in need.

SPECIFIC AIMS. Child maltreatment (**CM**, ie, physical, sexual, and emotional abuse, and neglect) is a major public health problem whose physical, developmental, and mental health consequences[23-25] extend into adulthood,[26-29,] costing the US economy an estimated $450 billion per year.[30] Accurate identification of at-risk children and effective reporting of suspected CM by mandated reporters (**MR**s) are keystones for protecting children. However, because many people do not know what, when, and how to report, interpretation errors abound. The conflation of *poverty* with *neglect,* along with implicit biases (eg, preconceptions about CM and race or socioeconomic status), leads to disproportionate targeting of marginalized communities,[31] unwarranted reports, and report substantiation rates of just 20%.[32] Yet the failure to appropriately identify and report at-risk children also results in significant *under*-reporting of actual CM.[32] Existing programs purported to prepare **MR**s are highly variable in both content and quality.[18,19] By contrast, Penn State's *iLookOut MR Training* (**MRT**), with its video-based storyline[33-35] has been shown in randomized controlled trials and real-world studies to significantly improve knowledge and change attitudes about CM and its reporting[21,22] –which explains, the National Office of Head Start's adoption of *iLookOut's* MRT for its staff nationwide.[33]

For this NICHD Fast-Track STTR project, d'Vinci Interactive and Penn State propose to leverage the *iLookOut* MRT to develop and evaluate **Beacon of Child Safety ('Beacon')**, a novel educational solution that will provide scalable, online evidence-based MRT for individuals, states, and organizations across the country. Phase I (**PI**) will focus on developing an integrated relational database and learning management platform along with an interactive, prototype Core MRT that is engaging and can be tailored to state-specific MR requirements; Phase II (**PII**) will scale these components and also create a highly immersive Advanced MRT that expands learners' understanding of (a) CM and its reporting, (b) how to effectively support at-risk children and their families, and (c) how implicit bias can affect decision-making. Accordingly, our study aims are:

PI-Aim 1: *Create and populate a relational database and API that can dynamically create up-to-date state-specific MRT for 5 major US states.* To do so, we will 1) conduct a granular analysis of MRT requirements for CA, FL, NY, PA & TX; 2) systematically categorize MRT requirements into searchable fields; 3) build a relational database and populate it with relevant state-specific MR laws/policies; 4) pair that database with d'Vinci's learning management system (ecoLearn® LMS) to then 5) generate MRTs for PA and TX; and 6) test the accuracy and completeness of the MRTs for PA and TX –as confirmed by an approved regulator from each state.

PI-Aim 2: *Develop and pilot test the effectiveness of 3D/animated character and simulation styles.* Drawing on evidence-based approaches, we will develop diverse characters and simulation styles involving various races/ethnicities, socioeconomic backgrounds, and settings (home, work, public space). Formative testing will collect both qualitative and quantitative data from 16 participants from diverse backgrounds to determine whether they find the characters and simulation styles acceptable, relatable, and engaging.

PI-Aim 3: *Enhance current iLookOut storylines to help learners identify 1) true indicators of CM, and 2) implicit biases that could impact decisions about reporting suspected CM.* We will enhance and augment 3-5 case scenarios from *iLookOut*'s existing evidence-based MRT by integrating 3D/animated character and simulation styles (per Aim 2) and adapting character profiles, demographics, backgrounds, and settings to elucidate both indicators of CM and common implicit biases—resulting in an engaging, interactive story-based experience. Formative testing with 50 participants from diverse backgrounds will evaluate engagement (via embedded data capture features –eg, eye tracking and cursor heat maps) and relatability.

PII-Aim 4: *Expand the dynamic, relational database, API, and learning management platform to include state-specific MRT requirements for all 50 US states.* Following 1) a granular analysis and categorization of MRT requirements for the other 45 states, we will 2) populate *Beacon*'s relational database/API (PI-A1); 3) develop infrastructure for a learner portal as well as data dashboards for administrators and regulators; and 4) test the accuracy and completeness of MRTs for CA, FL, & NY –as confirmed by an approved regulator from each state.

PII-Aim 5: *Complete build-out of the Core MRT to be inclusive, promote critical thinking, and be engaging to a wide array of MRs.* Building on the diverse 3D/animated character and simulation styles (PI-A2&3), we will finalize the interactive, story-based Core MRT and pilot test (n=50) its impact on learners' ability to identify CM-related biases. We will also develop a Spanish-language version of *Beacon*'s Core MRT.

PII-Aim 6: *Build out the Advanced MRT as a highly immersive capstone learning experience.* Building on diverse characters/styles developed in Aims 2&5, we will develop a highly immersive *capstone learning experience* for learners to take a first-person role in assessing possible signs of CM and deciding what to do.

Summative Evaluation: We will conduct a randomized control trial (n=300 in CA, FL, PA, NY, TX) to evaluate the impact of *Beacon*'s Core MRT on *knowledge* and *attitudes* regarding CM; the impact of *Beacon*'s

Advanced MRT on the ability to *identify CM-related biases;* and learners' 'user experience' with both trainings (ie, *acceptability, appropriateness, satisfaction, ease of use,* and *whether it kept their interest/attention*).

Once developed, the *Beacon* solution will provide highly engaging and effective training to a variety of MRs nationwide, helping them become better equipped to identify and support at-risk children and their families.

1. Significance: *The Societal Need We Aim to Address.* Child maltreatment (**CM**, ie, physical, sexual, and emotional abuse and neglect) is a major public health problem that has physical, developmental, and mental health consequences that extend into adulthood,[23-29] costing the US economy an estimated $450 billion per year.[30] Accurate identification of at-risk children and effective reporting of suspected CM are keystones for protecting children. For that reason, all US states require most (and sometimes all) adults who work or volunteer with children to be Mandated Reporters (**MRs**) for suspected CM, with legal penalties for willful failure to report CM.[32,36] Yet mandated reporting suffers from dual problems of both over-reporting (when suspicion of CM is unwarranted) *and* under-reporting (of true CM cases). Accordingly, ~80% of the 4.4 million CM reports (involving 7.5M children) turn out to be unsubstantiated[32] —a staggeringly high false alarm rate that both strains limited resources of child welfare systems and introduces unnecessary, potentially harmful stress to families.[37] And yet research suggests CM's true incidence is 2-3x higher than the ~650,000 confirmed cases per year in the US[32] –meaning that the failure to appropriately identify and report CM leaves many children in harm's way. This risk of harm is especially acute for younger, more vulnerable children who cannot protect themselves.

A major reason for the co-occurrence of over-reporting and under-reporting of CM is that many MRs do not know what, when, and how to report. So, too, many people conflate *poverty* with *child neglect* –often due to implicit biases regarding race and socioeconomic status.[1,2] Such bias leads to disproportionate reporting within marginalized communities, which compounds stress and trauma and often unnecessarily disrupts families.[4] While effective MR training (**MRT**) has been linked to better discernment of CM,[38] existing MRT is highly variable in both content and quality,[19,39,] with only 11 states even using pre-/post-tests to assess training efficacy and none using validated measures.[18,19] As a result, multiple states and stakeholders are calling for ready access to high-quality, evidence-based MRT to better support front-line MRs to identify CM.[39-41] This includes the NIH, which has identified high-quality, nationwide MRT as a priority.[41] To address this societal need, d'Vinci Interactive (**d'Vinci**) and The Penn State College of Medicine (**PSCOM**) propose to develop and evaluate a full-function prototype of ***Beacon of Child Safety ("Beacon")***, an innovative online solution for providing **scalable, effective, evidence-based MRT to individuals, states, and organizations across the country**. The proposed *Beacon* solution builds on PSCOM's *iLookOut for Child Abuse* (**iLookOut**) **MRT,** which has been shown in NICHD-sponsored randomized controlled trials and real-world studies to significantly improve knowledge and change attitudes about CM and its reporting,[21,22] and has been adopted by the National Office of Head Start as the recommended MRT for Head Start programs nationwide.[33]

The Challenges We Aim to Solve. Our solution aims to simultaneously address several challenges.

The Complexities of Identifying CM. Signs of CM can be subtle or mistakenly attributed to other causes. So, too, the intricacies of identifying and reporting suspected CM can be overwhelming to the various individuals who qualify as MRs. Moreover, people often make assumptions about families whom they judge to be "different" from them, including confusing poverty with neglect –a conflation that can have devastating consequences for marginalized populations.[42-45] An effective MRT must prepare learners to discern true CM signs and risk factors while also helping them recognize implicit biases that can lead to under- and over-reporting. The *Beacon* program will expand and scale *iLookOut's evidence-based* curriculum by enhancing its interactivity, personalizing the learning experience, and adapting it to serve MRs in all 50 states.

Inequities in CM Reporting. Research shows that historically marginalized populations are much more likely to be reported for suspected CM –with 55% of Black children being reported to child welfare by the time they are 18 years old.[45,46] Because such disparities reflect underlying inequities in society, effective MRT needs to promote greater awareness and better decision-making. To address this challenge, *Beacon*'s interactive, story-based training will feature diverse and relatable characters and leverage evidence-based behavioral strategies[47,48] to help learners become more reflective about factors that influence perceptions and judgments about at-risk children and their families. This includes promoting *critical thinking skills, understanding what reasonable suspicion means, collaborative approaches to support at-risk children, greater awareness of the lived experiences within marginalized communities,* and *strategies for reducing inappropriate and/or disproportionate reporting*. In Phase II, we will also develop a Spanish-language version of *Beacon*'s Core MRT.

Lack of Engaging, Tailored MRT. Among the tens of millions of people who qualify as MRs, there is considerable variability in the backgrounds, sophistication, and motivation to learn about CM. Accordingly, an

effective MRT must balance the conceptual complexities of identifying and reporting suspected CM with scenarios that are relatable and engaging across a wide range of learners. Because a sophisticated, multi-faceted didactic learning experience promotes engagement while allowing for an effective asynchronous learning experience,[49] the ideal MRT solution requires a high degree of interactivity and personalization. To achieve this, d'Vinci and PSCOM will reimagine *iLookOut*'s existing evidence-based MRT to make a more dynamic, interactive, and immersive learning experience that uses spaced retrieval and practice to promote engagement and can be tailored to individual learners.

Large Variability in MR State Requirements. In addition to unique state mechanisms for reporting suspected CM, significant differences in how states define CM[2,36] (eg, age of consent for sexual activity; allowable forms of corporal punishment; when and for how long a child may be left unattended; whether witnessing domestic violence constitutes CM) require MRT to be tailored for each state. Appreciating these differences is particularly important for MRs who work in multiple states (eg, Red Cross workers, FEMA employees, traveling nurses). Therefore, the proposed *Beacon* solution will create a database of relevant laws and policies that can dynamically assemble and deliver MRT to match policies and legal requirements for any state. *Beacon* will also enable cross-state MRT by developing a compare-and-contrast feature that can generate a 'differential' training that accounts for differences and/or additional content to meet MRT requirements for a new state and provide completion certificates. *Beacon* will also enable MR regulators (eg, state agencies) to access a centralized informational database to review and assess laws, policies, and resources on CM (currently silo-ed on state-specific websites with no central repository).

Figure 1: Standard Online MRT (UPitt MR Training)

Societal Contributions. The *Beacon* platform will promote more effective and equitable outcomes for at-risk children and their families by preparing childcare providers, healthcare workers, teachers, social workers, coaches, community volunteers, law enforcement, and other MRs nationwide to identify signs of CM and understand what, when, and how to report. *Beacon* aims to have both **motivational** and **transformative impact** on MRs' understanding and critical thinking regarding CM, their ability to effectively report suspected CM, and their preparedness and empowerment to support at-risk children and their families. In doing so, *Beacon* will help (a) better protect at-risk children —especially those who suffer in silence, (b) lower the likelihood of unwarranted targeting of families struggling with poverty, and (c) promote greater access to support services for families experiencing inequities— see Burris and Badzek LOS.

Potential Commercialization. d'Vinci plans to offer the *Beacon* MRT solution as an institutional subscription product to companies, organizations, and non-profits, while offering purchase options for individual MRs. Institutional subscribers will have access to premium features such as class rosters, progress tracking, assessment, and certification for learners who complete the MRT. Benefits include: (for MRs) access to an effective learning approach that incorporates real-world applications and scenarios; (for organizational administrators) access to an administrative platform that provides oversight of MRT activities, progress, and certification, and includes integration with many common HR systems; (for state regulators) up-to-date access to other states' CM regulations and MRTs, which can help them assess, adopt, and validate policies and training. The need for this innovative new online training solution is also evidenced by letters of support from leaders in multiple fields. The product is planned to go to market in the Fall of 2028, with core revenue coming from subscriptions from MRs, small, medium, and large institutional accounts, federal entities, state regulators, and state contracts. At an average price of $24.99/yr. per individual and (based on size) $6,700-15,000/yr. per institution, we expect USD 1.9 million in annual revenue 5 years after product launch. We will initially market the product to organizations that require MRT, as well as prior *iLookOut* users (n=>60,000).

d'Vinci is ideally positioned to meet the critical management functions of the new *Beacon* training product –based on previous work designing, building, and launching education/certification platforms for clients such as Sandy Hook Promise, the Pennsylvania Coalition Against Rape, SAE International, and the American Board of Pediatrics. d'Vinci also has led the design and technical delivery of research-related training and certification products for the NIH's Office of Human Subjects Research, Office of Extramural Research, Office of Intramural Research, and National Institute on Drug Abuse. *Beacon* will be one of several d'Vinci-owned/run educational

products capable of producing a stable, growing income. d'Vinci has already completed development (funded by NIH SBIR Phase I and II grants) of *Blueprint of Life*, an online life sciences educational product about the importance of genomics and the future of health and personalized medicine, which entered Phase III commercialization in summer 2024. The PSCOM team, in turn, has extensive experience managing previous *iLookOut* research grants (awarded by the NICHD) and can effectively support the launch and ongoing growth of the proposed *Beacon* product by providing thought leadership, outreach, and subject matter expertise in partnership with d'Vinci. The PSCOM team has a history of successfully recruiting >60,000 MRs (including childcare workers, teachers, social workers, medical professionals, pharmacists, dentists, clergy, and others) to complete the *iLookOut* training even in the absence of paid marketing strategies. The PSCOM team's involvement in the commercialization of the *Beacon* platform will be supported by an already-established licensing agreement with Penn State. WestEd will serve as the research and evaluation partner for *Beacon*. WestEd is a non-profit educational research, development, policy, and service organization with national recognition for helping put research into practice for the betterment of all children. WestEd has successfully supported over 50 different small business partners in conducting research studies to support Small Business Innovation Research (SBIR) grants. WestEd's research will support the commercialization of *Beacon* through a series of formative research studies to help inform product development and summative studies to examine the impact of using *Beacon*.

2. Innovation: The proposed *Beacon* platform provides a complete, integrated technical solution that addresses the MRT and informational needs of various stakeholders. For **learners**, the *Beacon* platform will combine (a) evidence-based training content built around critical-thinking exercises, (b) content tailored to each MR's state of residence and prior MR certification for other states, and (c) engaging, interactive content, including 3D animated characters, personalized learning, and gamified, immersive case simulations. These elements will deliver an innovative learning experience that is effective, engaging, accessible, encouraging, inclusive, and geared towards the real-world needs of MRs. *Beacon* will provide **administrators** with real-time access to tracking, monitoring, and certification of learner achievement within their organization, as well as the ability to administer 'differential' training that educates employees who work in multiple states (eg, Red Cross workers, travel nurses) about state-to-state differences to help ensure compliance with state regulations. *Beacon* will also provide **regulators** (eg, state agencies) certification of evidence-based training and ready access to stay informed on MR-related matters in other states. (see Table A)

Table A: Overview of Key Features of the *Beacon of Child Safety* Solution

Content Features	**Evidence-Based Critical Thinking Exercises:** *Beacon* learning exercises will help learners identify true indicators of CM and develop awareness of implicit biases. Using scenarios that vary characters' race and economic background, interactive exercises will help learners recognize potential biases in decision-making and take steps to avoid unwarranted assumptions about at-risk children and their families. (Phase I, Aim 3 –PI.A3)
	Multi-Lingual Content: To engage learners from underrepresented groups, we will create a Spanish-language version of *Beacon*'s Core MRT (using as a template *iLookOut*'s Head Start Spanish-language MRT, which was rigorously translated using cultural advisors, dual-interpreter translations from English to Spanish and then back to English with formal reconciliation of language discrepancies) with further languages to be added later. (PII.A5)
	State-Specific Training for all 50 States: A robust relational database and API will catalog MRT requirements for all 50 US states, enabling comparison between states and dynamic assembly of state-specific MRTs. (PI.A1, PII.A4)
Interactive Delivery Features	**3D Animated Characters:** *Beacon*'s interactive, story-based MRT will feature diverse, relatable animated characters designed to appeal to learners regardless of race, ethnicity, gender, or socioeconomic background. (PI.A2)
	Personalized Learning Experience: Learners will be able to create a customized avatar (based on their personal profile) and have aspects of their MRT tailored to the circumstances in which they interact with children.
	Gamified, Immersive Case Simulations: Using research regarding biases that affect CM reporting, we will author, storyboard, and develop case simulations that involve 1) a diversity of children, families, and settings representative of the diversity found among American families, and 2) animated and video-based storylines, responsive learning exercises, pre/post-tests, and interactive feedback. Gamified decision trees with corresponding outcomes and constructive feedback will be designed to promote critical thinking. (PII.A6)
Admin Features	**Assessments & Reporting Dashboard (for administrators):** All institutional customers will be provided with real-time access to management and organization-level reporting on learners' progress and certification, as well as analytics that enable aggregate analysis of knowledge, attitudes, and awareness of biases within their organization and comparison with other *Beacon* learners. (PII.A4)

	Database for State Regulators: *Beacon*'s relational database will automatically update and notify users about state-specific training requirements, including changes within one's own and other states. (PII.A4)

Basis for the Innovation. The *Beacon* solution will enhance and expand on *iLookOut's* evidence-based curriculum with a particular focus on delivery features that leverage Self-Regulated Learning (**SRL**) –ie, the practice of learners intentionally following and monitoring their goal-directed learning activities.[50,51] Because most learners do not engage in SRL strategies in online learning environments, subpar learning outcomes, and high dropout rates are common.[52,53] *Beacon*'s MRT will leverage multiple behavioral interventions shown to promote SLR engagement and effective online learning, including 3D characters, realistic gamified simulations, and personalized learning.[54-57] By making the learning experience more relatable, these strategies significantly increase students' intrinsic motivation for learning as well as their understanding of educational content.[58-62]

How the Innovative Features Map onto the Training Modules. The *Beacon* solution includes 2 levels of training, both of which can be completed on smartphones and other mobile devices. **Level 1: Core MRT** (moderately immersive) teaches general knowledge needed for MR certification. Learners act as secondary decision-makers, using a video-based learning experience with recorded live actors. Learners follow a main character's journey through the fundamentals of CM reporting and MR responsibilities. **Level 2: Advanced MRT** (highly immersive capstone learning experience) reinforces and augments learners' MR knowledge base by providing a series of 10-15-minute interactive **<u>micro-learning exercises</u>** that use spaced retrieval and spaced practice to reinforce learning acquisition[63] and <u>expand learners' understanding of not only CM and its reporting, but also how to support at-risk children and their families</u>. Interactive simulations with 3D/animated characters help learners transition from being passive recipients of information to engaged primary decision-makers who must assess possible signs of abuse and make decisions about how best to protect and support children –all within a safe, simulated practice environment.

Shift from Current Tools. *Beacon's "competition" falls into 2 categories*: **state-based platforms** that provide MRT and certification to MRs within a single state (eg, the University of Pittsburgh's *Recognizing and Reporting Child Abuse* course –Fig.1) and **commercial platforms that provide MRT** (eg, Udemy, Compass, Simple LMS). As illustrated in Table B, existing commercial platforms have multiple deficiencies that

Table B: Comparison of *Beacon* with Other Existing Commercial MRTs

	Features	Compass	Udemy	Simple	Beacon
	Level of Engagement[19]	Basic	Basic	Limited	Advanced
	Evidence-Based Methodology	–	–	–	√
	Critical Thinking Exercises (for identification of *true* CM indicators and bias prevention)	–	–	–	√
	Multi-Lingual Content	–	–	–	√
	State-Specific Training Content for all 50 States	–	–	–	√
Interactive	3D Animated, Customizable Characters	–	–	–	√
	Personalized Learning Experience	√	–	–	√
	Gamified, Immersive Case Simulations	√	–	–	√
Admi	Learner Management & Progress Monitoring	√	√	–	√
	Learner Statistics & Organizational Reporting	–	√	–	√
	State MR Regulation Database (for regulators)	–	√	–	√

prevent them from providing high-quality MRT in terms of both content and delivery. <u>*Content*</u>: Prior research demonstrates that the *iLookOut* training —which is the basis of *Beacon*'s curriculum— is considerably more robust than other MRTs.[18,19] While all approved MRTs include definitions of CM, legal responsibilities, and the mechanics of reporting suspected CM, the vast majority fail to address key issues such as the relationship between CM and intimate partner violence or animal cruelty; observations and situations that should NOT raise concerns for abuse; or how MRs should (and should NOT) gather information. Moreover, none of the existing trainings are evidence-based, and none emphasize critical thinking.[9,19] *Beacon* will be the only solution to offer not only 1) evidence-based training but also 2) a strategy for learners to identify and counter implicit biases that can impact decisions about suspected CM, and 3) an online MRT that can meet the differing requirements of all 50 US states. <u>*Interactive delivery*</u>: Most existing MRTs present information as a simple slideshow and/or video, with no (or very limited) interactive features.[9,36] None offers the high level of interactivity, personalization, immersiveness, or engagement that *Beacon* will deliver. *Beacon* also will provide *administrative features* for learner management and state regulation updates that make it unique. Overall, no existing competitor offers the integrated combination of features proposed by *Beacon*—a value proposition expected to make *Beacon* an effective and highly desirable solution for MR learners, administrators, and regulators alike.

3. Approach: The <small>FIRST</small> key component (see Fig.2) will be a robust, secure, and scalable relational database of
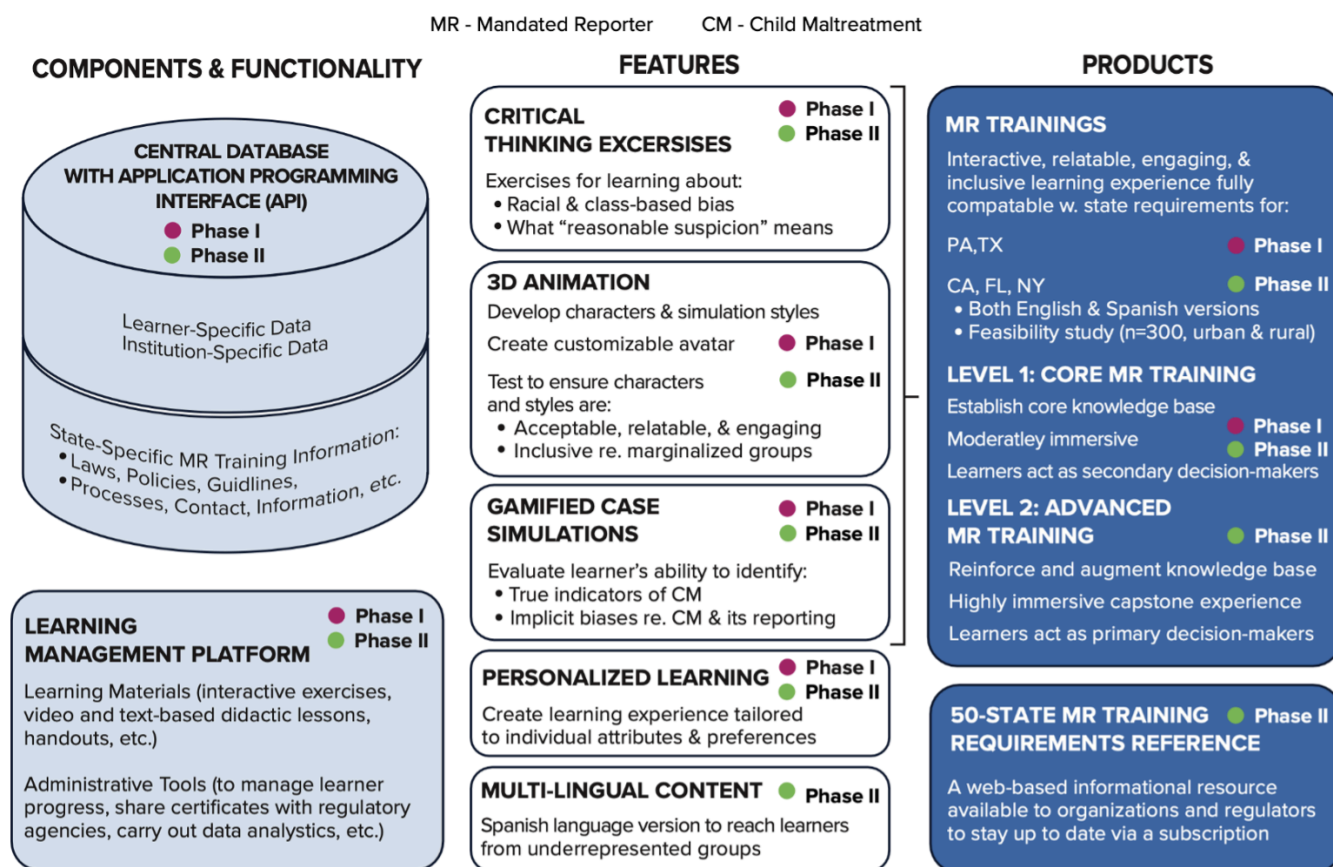
nationwide MRT requirements that will enable *Beacon* to 1) assemble learning content that matches learners' specific state requirements and also provide 'differential' trainings for MRs who work in multiple states (eg, Red Cross workers) and 2) serve as a source of reference and updates for state regulators. <u>For Phase I</u>, this relational database will include all information relevant to MRT for the 5 most populous US states (CA, FL, NY, PA, TX); for Phase II, it will be expanded for all 50 states. The <small>SECOND</small> key component will be a state-of-the-art learning management platform with learning materials and administrative tools that support both the Core MRT (Level 1) and the Advanced MRT (Level 2). These two trainings will be built out and tested, with a focus on Core MRT during Phase I and Advanced MRT during Phase II.

3. PHASE I – Aims. Our plan for accomplishing the Phase I Aims is detailed below.

Aim 1: Create and populate a relational database and API that can dynamically create up-to-date, state-specific MRT for 5 major US states. The study team will first conduct a granular analysis of MRT requirements for CA, FL, NY, PA, & TX, categorizing MRT requirements for ready integration into courses for learners and reference sources for regulators. Categorization will proceed iteratively, building on the PSCOM team's existing databases for MRTs in PA and ME. This includes categories regarding definitional content (eg, *who is an MR, who counts as a perpetrator, anonymous vs. non-anonymous reporting, age of consent, the definition of neglect*), mechanistic issues (eg, *how to report suspected CM, timeframe for reporting*), and compliance issues (eg, *required duration* and *frequency of MRT*). These state-based requirements will be collected and reviewed by multiple team members for accuracy and consistency prior to importation. To construct *Beacon*'s relational database, the data and API will be developed and deployed with a focus on industry-standard best practices for security, performance, and disaster recovery.[64,65] The web platform and API will be tested regularly against the OWASP Top 10 security vulnerabilities. To deliver MRT content to the larger *Beacon* ecosystem as well as external partners and subscribers, a RESTful API will be developed in conformity with the design principles of the representational state transfer architectural style.[65] The API will abstract the retrieval of MR training data so that it can be uniformly retrieved by state and assembled dynamically upon request. The data will then be seeded into a relational SQL database for use in the web-based *Beacon* of Child Safety platform. The API will also be utilized to retrieve and display multi-state MR requirements to regulators for cross-examination. Another set of API endpoints will be created in the *Beacon* system to share MR training progress with external HR information systems so that organizations can dynamically keep their users' compliance status up to date. The API will be programmed using node.js, and queries will be returned in JSON. Once the database and API are in place, their robustness and security will be tested, and a reliable database backup system will be established for data recovery if a failure occurs (both full and differential backups). To protect from common attacks against web APIs, security for the database and API will be enhanced both at the application code level (by implementing security libraries that manage authorization declaratively) and at the policy level (by defining policies that restrict user access to portions of the database rows based on user attributes), with strong passwords required for all database administrators. Once the database is populated with state-specific content, the accuracy and completeness of each state-specific training will be judged by an approved regulator in that state, with an initial focus (ie, Phase I) on PA and TX. PA was chosen because the PSCOM team already has experience working with PA regulators to obtain approval for the *iLookOut* program. TX was chosen because its MRT requirements differ considerably from PA's and its demographics/socio-cultural diversity will enable more full-bodied beta-testing of *Beacon's* acceptability (cf, Aims 2 & 3). **Aim 1 will be achieved** if PA and TX regulators deem the MRT generated for their respective states accurate and complete.

Aim 2: Develop and pilot test the effectiveness of 3D/animated character and simulation styles. Characters and scenarios will be designed to: (a) be engaging, (b) be acceptable and relatable for MRs from all backgrounds, (c) avoid stereotyping, and (d) help distinguish implicit biases from genuine CM indicators. Of particular importance will be the focus on depicting diverse and underrepresented demographic groups in the creative imagery to help counter preconceived assumptions about race and class that MRs may hold. Using industry-standard 3D design and animation tools, d'Vinci visual artists will develop and test diverse character and simulation styles for engaging learners.

Fig. 3: Example Diverse 3D Characters

Drawing on evidence-based approaches for designing avatars for e-learning,[66] we will develop diverse characters (see Fig. 3). Authentic character design (to ensure that learners see themselves represented in the storylines) will be an essential factor for engaging learners. Beyond racial and ethnic diversity, characters will represent varying socioeconomic status, sexual orientation, gender identity, and ability/disability. The material will include characters who are similar in profession to key professional groups who require MRT. Simulation styles involving a variety of realistic, immersive settings/environments (eg, home, work, childcare, hospital, and public space) will be developed and tested with animated characters for acceptability, relatability, and engagement (see Figures 4 and 5). This will follow d'Vinci's established creative process: 1) conducting **discovery** sessions with stakeholders and subject matter experts to ensure character and simulation styles are precisely tailored and impactful to learners; 2) **imagining** and refining initial artwork concepts; iteratively 3) **creating** and 4) **reviewing** characters, and 5) **delivering** the final Phase I artwork. To develop creative

content that features and resonates with underrepresented demographic groups, we will use formative testing to course-correct early in the design process and

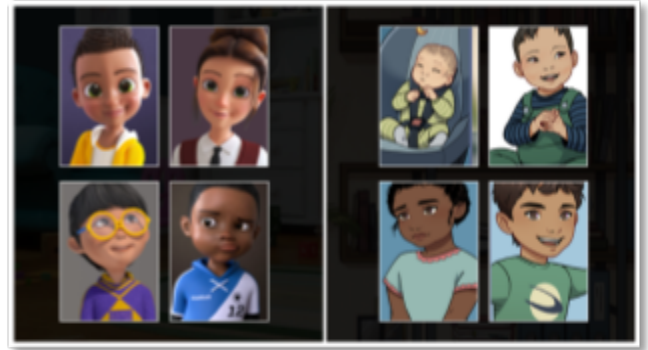Fig. 4: Example Diverse Background/Simulation Styles

Fig. 5: Example 3D vs. 2D Character Styles

iteratively validate character and simulation styles.

Formative Testing, Initial Usability Testing. WestEd will conduct an initial usability study early in Phase I to inform revisions needed for product development and to determine whether the proposed 3D animated characters and simulation styles facilitate a user experience that is acceptable, relatable, and engaging. The study will include 16 individuals recruited using *iLookOut* contacts, comprising 4 social workers, 4 teachers, 4 nurses, and 4 childcare providers, with varied races and ethnicities. Participation will involve a 60-minute online session with 2 WestEd researchers and will provide a $60 incentive. WestEd will develop a detailed observation protocol to collect qualitative data that includes user actions and utterances as they engage with the interactive learning exercises as well as verbal responses to a semi-structured interview, which will include quantitative ratings for engagement, relatability, and acceptability. Interviews will be audio-recorded and transcribed and, along with observation notes, will be coded and analyzed by WestEd. **Aim 2 will be achieved if** there is convergent evidence from the qualitative and quantitative user data that the 3D characters and simulation styles provide an acceptable, relatable, and engaging user experience (see *Measures*).

Aim 3: Enhance current iLookOut storylines to help learners identify 1) true indicators of CM and 2) implicit biases that could impact decisions about reporting suspected CM. The PSCOM team will work with d'Vinci instructional designers and consultants (Kapp and Payne) to enhance and augment 3-5 case scenarios from *iLookOut's* current evidence-based MRT. This will include the integration of 3D/animated characters and simulation styles (identified in Aim 2), as well as adaptation of character profiles, demographics, backgrounds, and settings to elucidate both indicators of CM and common biases.

Table C: *Phase I Timeline*

TASK	LEAD PERSON*	Year 1			
		Q1	Q2	Q3	Q4
Project Initiation (Project planning, task tracking, time tracking setup, stakeholder communications, and kickoff meeting)	M.S.	■			
Aim 1: Create and Populate Relational Database to dynamically generate state-specific MRT for 5 major U.S. States	M.S.	■	■	■	
Research and Compile MRT requirements for CA, FL, NY, PA, & TX	B.L.	■			
Database Programming	E.M	■			
Regulatory Agency Testing	J.F.		■	■	
Learning Management Platform Infrastructure QA	E.M.			■	
Aim 2: Create 3D/Animated Character Styles	M.S.	■	■	■	
Concept Sketches	J.F.	■			
Design Character Prototypes	J.F.	■	■		
Finalize Multi-View of Each Character	J.F.		■		
Formative Usability Study to test 3D/Animated Characters	A.G.			■	
Aim 3: Develop 3-5 Case Scenarios that test learners' ability to identify true CM indicators and biases that could impact decisions	B.L.			■	■
Develop 3-5 Gamified Scenarios	J.F.			■	■

Formative Testing, Second Usability Testing. WestEd will conduct a second usability study (using the same research questions as the initial usability study in Phase I Aim 2) to confirm and inform further product development. Because of *iLookOut's* extensive testing with

Integrate into *Beacon* MRT	J.F.					
Quality Assurance Testing	J.F.					
Formative Usability Study	A.G.					
Final Development Adjustments (with 3-5 case scenarios)	E.M.					X

M.S. = Mason Scuderi (d'Vinci) | B.L. = Dr. Benjamin Levi (PSCOM) | J.F. = Jenny Fedullo (d'Vinci) | E.M. Eric McDonald (d'Vinci) | A.G. = Andrew Grillo-Hill (WestEd)

childcare providers, this formative testing of *Beacon's* MRT will focus on social workers, nurses, and teachers (n=50) from diverse backgrounds recruited through existing d'Vinci and PSCOM contacts in PA and TX to complete a ~30-minute asynchronous online learning experience and receive a $30 gift card. This training experience will include embedded data capture features, scale measures used in Aim 2 formative testing, and behavioral measures (eg, time spent per screen, eye tracking, facial expressions, and cursor heat maps to assess visual elements that engage users' attention most frequently and/or for the longest duration[67] (see *Measures*). WestEd and d'Vinci will co-develop the online recording system to track user mouse movements, facial expressions, and actions[68] during the concept training experience. WestEd will analyze data, provide a written summary of the cumulative Phase I findings, and hold a debrief meeting with other key team members to discuss recommendations for Phase II activities. **Aim 3 will be achieved if** there is convergent evidence through the data captured (time spent per screen, eye tracking, facial expressions, and cursor heat maps) that participants remain engaged in the MRT tasks and complete them in an expected amount of overall time.[68]

Benchmarks for success. If the aims of Phase I are met, we will have: 1) created and populated a relational database that can dynamically create up-to-date, state-specific MRT for 5 major U.S. states (CA, TX, FL, NY, and PA); 2) received regulator approval that the MRTs developed for PA and TX are accurate and complete; 3) developed 3D/animated character and simulation styles that provide an acceptable, relatable, and engaging user experience; and 4) enhanced the *iLookOut* storylines to help learners' identify true indicators of CM and implicit biases that could impact decisions about reporting suspected CM. By conducting the activities described in Phase I, we will lay the groundwork for the creation of the innovative *Beacon* platform, which will be fully developed into a commercial solution in Phase II.

PHASE II – Aims. Our plan for accomplishing the Phase II Aims is detailed below.

Aim 4: Expand the dynamic, relational database, API, and learning management platform to include state-specific MRT requirements for all 50 US states.

This relational database will be built on d'Vinci's own Learning Management System platform (ecoLearn® LMS), which has been used to meet training and certification needs for PA State Chiefs of Police, Northeast Counterdrug Training Centers, and multiple other organizations. Expandable functionality (eg, registration, learner management, content management) is already pre-built into ecoLearn®, which utilizes the open-source content management framework Umbraco. Using ecoLearn®, d'Vinci will develop a reliable, accessible infrastructure that seamlessly integrates the *Beacon* training, the state-specific relational database, and the supporting API. Substantial customization capabilities will then be added to support novel *Beacon* project features, including pre/post-testing, state-specific content, and downloadable resources.

A4.1 Building on the learning management platform infrastructure developed during Phase I, we will expand the platform functionality to support the 50-state solution for MRT using a .NET framework using an Amazon Web Services-provisioned server environment. This will include (1) a granular analysis of MRT requirements for each state; (2) expansion of the database (as needed) to include new categories of MRT requirements; (3) population of the database with relevant state-specific laws, policies, contact information, etc.; and (4) categorization of common and unique attributes for state-specific MRT requirements (eg, timeframe for reporting CM, human trafficking definitions, categories of professionals who qualify as MRs) to inform Narrow AI comparison of state-based differences.[69-71] Then, we will conduct extensive quality reviews to ensure that the integrity and functionality of the relational database and its corresponding API (created in Phase I, Aim 1) can dynamically aggregate complete and accurate materials to match MRT requirements for each of the 50 US states.
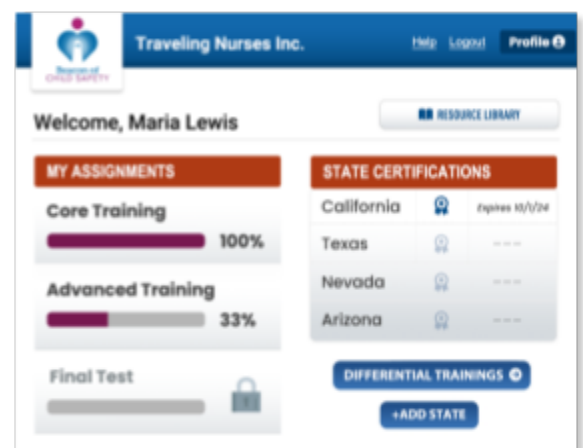
Fig. 6: Learner Portal View

A4.2 In parallel with programming and populating the database, we will develop the infrastructure and features needed to assemble/deliver interactive, engaging state-specific MRT along with administrative tools for conducting analytics and generating/sharing progress reports, certificates of completion, etc. *Beacon*'s dashboards will be programmed to enable learners and administrators to both compare different states' MRT requirements and receive automatic updates when state-specific training requirements change. To do so, state-specific laws, policies, contact information, and MRT requirements will be reviewed and updated by *Beacon* staff on a quarterly basis.

Fig. 7: Institutional Admin Dashboard

A4.2-1 Using the UI/UX design process d'Vinci implemented in the NIH-funded *Blueprint of Life* online learning platform, we will develop a **Learner Portal** (with assignments, progress updates, and account profile management) whose personalization features enable content to be customized based on a learner's state, profession, and personal profile (see Fig.6).

A4.2−2 For the **Institutional Admin Dashboard**, we will create tiered access to real-time data on learner progress and certification at the organizational level, tools to manage training access for members, certificates of completion (issued for each state for which a MR completes a full or differential MRT –see A4.2-4), and aggregate data to help assess strengths, weaknesses, and opportunities for improvement. API endpoints will be created in the *Beacon* system to share MR training progress with external HR information systems so that organizations can dynamically keep their users' compliance status up to date. We expect institutions will incorporate this training compliance product into their instruction and certification workflows (see Fig.7).

Fig. 8: Regulator Admin Dashboard

A4.2-3 A **State Regulator Admin Dashboard** will be developed to catalog laws, policies, and MRT requirements for all states and provide real-time updates/notifications of any changes (see Fig.8).

A4.2-4 Integrative Functionality will connect Administrative Dashboards and the Learner Portal with our centralized MR regulation database, allowing review and comparison of MRT requirements across states, creation of reports, and access to **Differential Trainings** for MRs who travel from state to state (eg, Red Cross workers) and need to understand differences in another state's MR policies and regulations.

A4.2-5 The *Beacon* learning management platform will support content delivery in multiple languages, beginning with a Spanish language version of *Beacon's* Core MRT (see *Aim 5*) and expand to other languages in Phase III (commercialization) based on market demand.

Aim 4-Evaluation. Each state-specific *Beacon* MRT will be evaluated by a regulator responsible for approving MRT training in that state. Given the focus of this STTR, **we will consider Aim 4 accomplished if** regulators for CA, FL, and NY deem the MRT generated for their state accurate and complete [note: the PA and TX MRTs will have already been evaluated in Phase I] –with the other 45 states evaluated in Phase III (commercialization). To accomplish this aim, we will leverage the PSCOM team's prior experience interfacing with state regulators.

Aim 5: Complete build-out of the Core MRT to be inclusive, promote critical thinking, and be tailored to engage the wide array of MRs.
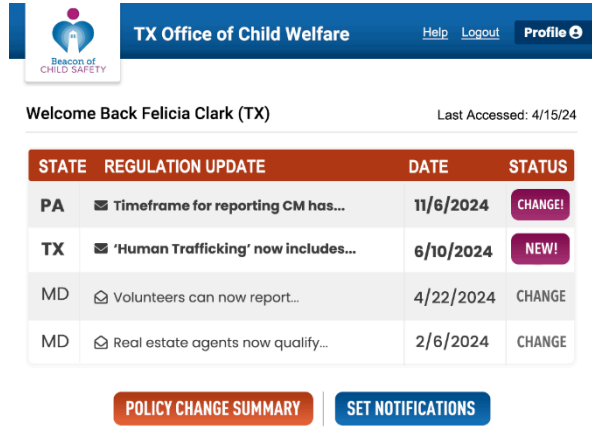
Table D: *iLookOut* Curriculum

Section	Lesson
Recognition (~1 hr)	(1) Types of CM (2) Facts and Consequences of CM (3) Risk Factors

Using 3D/animated character and simulation styles developed and tested in Phase I (Aims 2 & 3) as well as insights from the Phase I evaluation (Aim 3), we will finalize the enhanced, interactive Core MRT with scripted videos containing diverse and relatable characters. This Core MRT (which will take 2-3 hours for learners to complete (asynchronously and at their own pace) will position learners as secondary decision-makers who (through multiple-choice, fill-in-the-blank, knowledge check quizzes, open-ended text entries, and true/false questions) <u>assess</u> whether particular scenarios and actions do or do not constitute CM; <u>learn about</u> the mechanics of reporting CM and how such decisions play out; <u>discover</u> how various factors (eg, socio-economic status, race, ethnicity) may impact both the assumptions and responses of MRs; and <u>learn steps</u> that can help avoid unwarranted assumptions about at-risk children and their families. This will include topics such as understanding what reasonable suspicion means, collaborative

	(4) Indicators of CM
	(5) Bumps, Bruises, & Brain Injuries
Responsibility (~1 hr)	(6) Understanding the Law and Your Role
	(7) Reasonable Suspicion
	(8) Reporting CM
	(9) Challenges & Barriers
Action (~1 hr)	(10) Communication
	(11) How Diversity Affects Recognizing CM
	(12) Protective Factors & Resilience
	(13) Preventing CM
Conclusion & Certification	(14) If You Don't Protect Children, Who Will?

approaches to support at-risk children, greater awareness of the lived experiences of marginalized communities, and <u>strategies for reducing inappropriate and/or disproportionate reporting</u>.

To implement <u>Aim 5</u>, we will (1) create a Standards-Aligned Curriculum (using *iLookOut*'s existing curriculum as a starting point –see Table D); (2) combine learning content with storyboarding and graphic design; (3) integrate UI/UX design that leverages diverse 3D/animated characters and simulations styles; (4) enhance the existing storylines to better elucidate true indicators of CM and show how biases can impact reporting; and (5) assemble these elements into an engaging, easily accessible learning experience. This will include working with a consultant (see Payne LOS) with expertise in implicit bias education.

Spanish Translation. Applying the method used to create iLookOut's Head Start Spanish-language MRT, Beacon's Core MRT will be reviewed by cultural advisors; then translated (independently) by 2 certified translators into Spanish; discrepancies reconciled; translated back to English by 2 certified translators; again, discrepancies reconciled; then final-edited and piloted tested.

Aim 5 - Evaluation. WestEd will conduct a Pilot Study (n=50) of *Beacon's* Core MRT to evaluate its effect on MR *knowledge* (**Research Question-RQ 1**), *attitudes* (**RQ2**), and *bias recognition* (**RQ3**). This pilot study will provide d'Vinci with formative feedback to facilitate refinement of and improvements to *Beacon's* Core MRT and allow WestEd to test the study procedures, processes, and instruments prior to summative evaluation of *Beacon's* MRT. To avoid potential confounders, for the summative evaluation we will recruit individuals with no prior MRT experience from <u>college programs</u> in Education, Nursing, and Social Work (who will be offered a $150 incentive). Pre-intervention data will include demographic information and previously validated assessments of *knowledge* and *attitudes* regarding CM and its reporting.[72,73] Post-intervention, these assessments will be repeated along with validated user experience measures of *acceptability*, *appropriateness*, and *satisfaction*, plus questions asking about *ease of use* and *participants' engagement*. Recognition of biases will be assessed during interactive learning exercises within the Core MRT (see *Measures*). WestEd will provide an Executive Summary, a full report, and a discussion of actionable recommendations for revisions. **Aim 5 will be achieved if**, for each of the scale measures used in the study, average ratings are above the scale midpoint and if there are positive increases between pre and post measures examined by statistical significance and effect size (see **Measures**).

Aim 6: Build out the Advanced MRT as a highly immersive capstone learning experience.

Building on *Beacon's* Core MRT (with its 3D/animated character, simulation styles, and case scenarios to support recognition of biases that can impact decisions about suspected CM–see Aim 5), we will develop a **highly immersive *capstone learning experience*** for learners to practice applying their knowledge in a safe, secure environment. This <u>Advanced MRT</u> will place learners in a 3D animated simulation (see Fig. 9) where they take the <u>first-person role</u> of assessing possible signs of CM and making decisions about what to do. This first-of-its-kind, interactive learning experience will provide a realistic simulation to not only assess knowledge and decision-making, but also identify potential biases

Fig. 9: Interactive Scenario Advanced Training

and provide feedback –as learners respond to scenarios involving (similarly situated) children from differing ethnic and socioeconomic backgrounds. These immersive simulations will be designed in collaboration with a consultant with expertise in implicit bias (see Payne LOS) to both strengthen and evaluate learners' ability to distinguish poverty from neglect and to appreciate that CM occurs across all socio-economic levels. They will also help learners transition from passive recipients of information to engaged primary decision-makers.

Real-time granular feedback will provide opportunities for learners to revisit decision-points to see how different choices affect outcomes. Interactive modalities (see Fig. 10 & 11) will include choose-your-own conversation (with decision trees), drag and drop, multiple-choice, matching exercises, fill-in-the-blank, zoom to look closer, case study reflections, and knowledge checks. This training will use modern HTML5 open-source technology capable of delivering immersive, interactive, 3D experiences through a multitude of modern web browsers without the need for plug-in, app download, or specific hardware.

Fig. 10: Interactive Scenario Advanced Training

To implement Aim 6, we will (1) create learning content, storyboarding, and graphic design; (2) develop Case Simulations that test learners' ability to identify both true indicators of CM and biases that may affect decision-making; (3) implement UI/UX design using 3D/animated character styles; and (4) integrate the interactive and didactic components to create a highly immersive Capstone Learning Experience. Evaluation of Aim 6 will involve assessing the learner's 'user experience' and will occur as part of the overall *Summative Evaluation*.

Summative Evaluation: WestEd will carry out a Randomized Control Trial to evaluate the impact[5] of *Beacon*'s Core MRT on *knowledge* regarding CM (**RQ1**) and *attitudes* regarding CM (**RQ2**); the impact of *Beacon*'s Advance MRT on learners' ability to identify biases that may impact decision-making about CM (**RQ3**); and learners' user experience with *Beacon*'s Core MRT (**RQ4-a**) and Advanced MRT (**RQ4-b**).

Fig. 11: Interactive Scenario Advanced Training

Sample. To avoid potential confounders, we will recruit 300 individuals (from CA, FL, NY, PA, TX) with no prior MRT experience from college programs in Education (n=100), Nursing (n=100), and Social Work, (n=100). To test acceptability among historically marginalized groups and to reflect US demographics, we will aim to have 40% of participants be (self-identified) African-American, Hispanic, Native American, or Asian-American. To minimize both attrition and access to outside resources, dates/times will be specified for groups of participants to complete all study activities, with an anticipated duration of up to 5-6 hours (across two sessions) –for which participants will be offered a $150 stipend. The sample size was determined based on a power analysis using the PowerUp! Tool.[74] Because previous research on the *iLookOut* MRT (which is the building block for *Beacon*'s Core MRT*)* found effect sizes of 1.09 for *knowledge* and .67 for *attitudes*,[21] we expect the present study to be sufficiently powered to capture changes in *knowledge, attitudes,* and *bias* resulting from *Beacon*'s Core MRT. Should challenges arise with recruiting participants, we will engage with existing institutional contacts who can facilitate recruitment (see Bazdek LOS).

Intervention & Control. Participants will access the *Beacon* platform and complete a demographics questionnaire and validated measures of *knowledge* and *attitudes* regarding CM and its reporting (~15 min). Half of participants will be randomized to repeat these measures after a brief (5 min) break, with the question order randomized to reduce the likelihood of pattern recall.[75,76] This test/re-test group will comprise the **Control Group** for this assessment of *Beacon*'s Core MRT. The other half of participants will be asked to complete *Beacon*'s Core MRT (lasting 2-3 hours), then retake the *knowledge* and *attitudes* measures, and complete validated user experience measures of *acceptability, appropriateness, satisfaction, program completion time, ease of use,* and *whether it kept their interest/attention.*[77-80] This test/*Beacon* MRT/re-test group will comprise the **Intervention Group** for this assessment of *Beacon*'s Core MRT.

Following a 20–30-minute break, Intervention Group participants will then complete baseline questionnaires about indicators and risk factors for CM, then _Beacon's Advanced MRT_, and then repeat the measures on CM indicators and risk factors plus the user experience measures administered for the Core MRT (lasting 2-2.5 hours). **Aim 6 will be achieved if** (1) _attitudes_ and _knowledge_ regarding CM improve pre to post for the intervention group above the control group with statistical significance ($p < 0.05$) and a medium effect size (Cohen's $d > 0.5$) and (2) user experience measures are each >5.5 on a 7-point Likert-type scale.

Measures. _Demographics_: age, sex, race/ethnicity, training program (ie, nursing, education, social work), prior experience with either MRT or reporting suspected CM. Phase I (Aims 2&3): _Usability Testing Observation Protocol_: WestEd will develop a detailed observation protocol to collect qualitative data, which includes learner actions and utterances during usability testing. _Usability Testing Interview Protocol_: WestEd will develop a semi-structured interview protocol that will include scaled questions adapted from the Online Student Engagement Scale (OSE),[81] the (Narrative) Transportation Scale –Short Form (TS-SF,)[79] and researcher-designed questions specific to _Beacon_'s Core MRT to measure relatability and acceptability. _Usability Testing Behavioral_: WestEd and d'Vinci will co-develop the online tracking system to record time spent per screen, as well as eye tracking and cursor heat maps during asynchronous user testing of _Beacon_'s Core MRT. Phase II (Aims 5&6): Learners' pre-/post _knowledge_ will be assessed using a validated 26-item instrument[72,73] with good reliability ($\alpha = 0.73$), comprising 5 subscales: _actions_ by adults that might constitute CM; _bruises_ that might indicate CM; _legal requirements_ regarding CM; _concerning signs or behavior_ indicating CM; and _legal penalties_ for failing to report CM. Learners' pre-/post _attitudes_ will be assessed using a validated 13-item scale (used previously with _iLookOut_[22,82]). _User Experience Post Core MRT and Advanced MRT_: An online survey will measure _engagement_, _relatability_, and _acceptability_ using the same select questions developed for the semi-structured interview protocol. This survey will also include validated measures of _satisfaction_ (single item, 10-point Likert-type scale),[81] _ease-of-use_,[78] and _appropriateness_ (single item, Net Promoter Score),[83] along with _completion time_ (single item, continuous scale). In-program items on _implicit bias_ recognition will be developed by WestEd, consultant Dr. Keith Payne, and Co-PI Levi based on fit with scenarios/simulations and published research on biases (such as the Implicit Association Test which is a simple sorting activity and available to other researchers through minnoJS).

Analysis & Reporting. Analyses addressing RQ1, RQ2, and RQ3 will include all participants who complete pre-/post-test surveys. WestEd will use hierarchical linear modeling (HLM)[84] to examine baseline equivalence of the Intervention and Control groups, including demographic variables and baseline knowledge, attitudes, and biases among the Intervention and Control groups. After establishing baseline equivalence, WestEd will utilize 3-level HLM models with participants nested within programs as well as programs nested within states to address RQ1, RQ2, and RQ3. The HLM analyses will include participant-level pre-test measures and demographic covariates to increase the precision of the impact estimates. Consistent with best practices, WestEd will calculate effect sizes based on the standardized mean difference between Intervention and Control groups (ie, Hedges' _g_) for continuous outcomes. Analyses addressing RQ4-a will include all participants who complete a post-test survey after the Core MRT, and analyses addressing RQ4-b will include all participants who complete a post-survey after the Advanced MRT. RQ4-a and RQ4-b will be addressed using descriptive analyses to examine averages and percentages on items assessing _engagement_ and _satisfaction_. Additionally, the study will conduct exploratory analyses to understand differences in impacts and perceptions by state and preparation program type. The study team will develop a final report outlining findings from the _summative evaluation_ and recommendations to inform improvements moving forward.

Table E: _Phase II Timeline_

TASK	LEAD PERSON	Year 2		Year 3	
		1-6	7-12	1-6	7-12
Project Initiation (Project planning, task tracking, time tracking setup, stakeholder communications, and kickoff meeting)	M.S.	■			
Aim 4: Expand the relational database and learning management platform to include state-specific MRT requirements for all 50 U.S. states	B.L.	■	■	■	■
Conduct granular analysis of MRT requirements for all 50 states	B.L.	■			
Database & API Programming	E.M.	■	■		

Benchmarks for success. If the aims of Phase II are met, we will have: 1) obtained regulatory approval from CA, FL, and NY that the MRT generated for their state is accurate and complete; 2) expanded the dynamic, relational database, API, and learning management platform to include state-specific MRT requirements for all 50 US states; 3) completed the development of the Core MRT to be inclusive, tailored to engage the wide array of MRs, and promote critical thinking; and 4) demonstrated significantly greater change in attitudes and knowledge (regarding CM) in the Intervention group compared to the Control group.

Potential Problems. **1)** The largest potential problem is inadequate recruitment for the various phases of testing. To avoid this problem, we will (a) offer non-trivial stipends (up to $150) to college students we seek to recruit and (b) leverage WestEd's expertise and resources. Additionally, Co-PI Levi has close relationships with relevant university faculty in all 5 states, including individuals with broad professional reach (see, for example, Badzek LOS). **2)** Another

Task	Lead				
Accuracy and completeness testing by the agency responsible for approving MRTs in the five most populous states in the U.S.	B.L.		▪		
UI/UX Design & Storyboards (web application UI/UX, website copy, storyboarding and graphic design)	E.M.			▪	
Application Development (product development, programming, registration, account management, curriculum management, ecommerce integration)	E.M.		▪		
Develop Learner Portal & Institutional Dashboard, Admin Reports	E.M.			▪	
Develop Cross-State Differential Courses (for MRs who travel from state to state; conveys differences in state's MR policies)	J.F.			▪	
Develop 50 State Requirements Knowledge Base (to enable subscribers to compare different states' MRT requirements)	E.M.				▪
Quality Assurance Testing	E.M.				
Aim 5: Core MRT - Learning Modules Development	J.F.	▮	▮	▮	▮
Standards-Aligned Curriculum Adaptation (review of current *iLookOut* curriculum content, *Beacon* curriculum creation)	B.L.	▪			
Content Writing & Storyboards (learning module content writing, storyboarding, and graphic design)	J.F.	▪			
Integrate Case Simulations that Identify True Indicators of CM and Biases in Reporting	J.F.	▪			
UI/UX Design and Implementing 3D/Animated Character Styles	J.F.	▪			
Core Learning Experience Content Development	J.F.		▪		
Formative Testing - Pilot Study	A.G.				
Spanish Language Version of Core Training	J.F.			▪	
Final Adjustments (based on formative testing results)	J.F.			▪	
Aim 6: Advanced MRT - Capstone Experience Development	J.F.		▮	▮	▮
Content Writing & Storyboards (learning experience content writing, storyboarding and graphic design)	J.F.		▪		
Integrate Case Simulations (to help identify true CM indicators & biases)	J.F.			▪	
UI/UX Design and Implementing 3D/Animated Character Styles	J.F.			▪	
Capstone Learning Experience Content Development	J.F.				▪
Final Adjustments (based on formative testing results)	J.F.				▪
Summative Testing – Control Randomized Trial	A.G				▮

M.S. = Mason Scuderi (d'Vinci) | B.L. = Dr. Benjamin Levi (PSCOM) | J.F. = Jenny Fedullo (d'Vinci) | E.M. Eric McDonald (d'Vinci) | A.G. = Andrew Grillo-Hill (WestEd)

potential problem is identifying MRT requirements for all 50 states. To obviate this concern, Co-PI Levi has already enlisted a post-doc on his research team (Dr. Roberta Andrade) to begin researching this topic as part of her research activities. Several recent reviews [9,36,85] also provide a good starting point for this task.

Future Directions. This highly innovative Fast-Track STTR project will: **1)** create a comprehensive and integrated solution for delivering (and monitoring) high-quality MRT that can be individually tailored to meet the needs of MRs in all 50 states, which will **2)** help address the dual problems of over- and under-reporting suspected CM, and help **3)** establish a national standard for MRT that could potentially reduce state-to-state inconsistencies in how we protect children. As importantly, the *Beacon* solution will **4)** promote critical thinking, which includes helping learners to both recognize potential biases in decision-making and take steps to avoid unwarranted assumptions. Relatedly, the *Beacon*'s MRT will **5)** prepare MRs to not just report suspected CM but also look for ways to support at-risk children and their families. Additionally, the *Beacon* solution will **6)** make MRT more accessible, including a Spanish version of the *Beacon* training (with other languages to be added in the future). Finally, this proposed project will **7)** carry out rigorous research to expand the existing evidence-base for MRT and identify areas in need of improvement and/or further investigation.

Conducting the activities described in this Phase II proposal will lay the groundwork for the creation of an innovative, comprehensive, and robustly dynamic platform that can efficiently and effectively deliver high-quality MRT across all 50 states and prepare people to better support at-risk children and their families.

References.

1. Bywaters, P., Bunting, L., Davidson, G., Hanratty, J., Mason, W., McCartan, C., & Steils, N. (2016). *The relationship between poverty, child abuse and neglect: An evidence review*. York: Joseph Rowntree Foundation.

2. Child Welfare Information Gateway. (2023). *Separating poverty from neglect in child welfar*e. U.S. Department of Health and Human Services, Administration for Children and Families, Children's Bureau. https://www. childwelfare.gov/pubs/bulletins-povertyneglect.

3. Vannier Ducasse, H. (2021). Corrigendum to: Predictive risk modelling and the mistaken equation of socio-economic disadvantage with risk of maltreatment. *The British Journal of Social Work, 51(4),* 1520–1521. https://doi.org/10.1093/bjsw/bcab043.

4. Roberts, D. (2022). *Torn Apart: How the Child Welfare System Destroys Black Families and How Abolition Can Build a Safer World.* Basic Books.

5. Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Houghton Mifflin.

6. California Assembly Bill 506. (n.d.). *Praesidium.* https://www.praesidiuminc.com/california-assembly-bill-506/.

7. AB 506 Sets New Mandated Reporter Training Requirements for Volunteers. (2024). *Mandated Reporter Training.* https://mandatedreportertraining.com/resources/blog/ab-506-sets-new-mandated-reporter-training-requirements-for-volunteers/.

8. Youth Today. (2024, August). White House unveils new policies to transform child welfare. Retrieved from https://youthtoday.org/2024/08/white-house-unveils-new-policies-to-transform-child-welfare/

9. Walsh, K., Eggins, E., Hine, L., Mathews, B., Kenny, M. C., Howard, S., & Vagenas, D. (2022). Child protection training for professionals to improve reporting of child abuse and neglect. *Cochrane Database of Systematic Reviews, 7.*

10. Global Corporate Compliance Training Market 2023 Sector is Expected to Reach $12 Billion by 2030. (2023, November 8). *GlobeNewswire.* https://www.globenewswire.com/news-release/2023/11/08/2776216/0/en/Global-Corporate-Compliance-Training-Market-2023-Sector-is-Expected-to-Reach-12-Billion-by-2030.html.

11. Adroit Market Research. (2003). *eLearning Corporate Compliance Training Market.* Adroit Market Research. https://www.adroitmarketresearch.com/industry-reports/elearning-corporate-compliance-training-market.

12. Zippia. (2023, June 20). *30+ Essential U.S. Child Care Statistics [2023]: Availability, Costs, And Trends.* Zippia.com. https://www.zippia.com/advice/us-child-care-availability-statistics/

13. Statista. (n.d.). *Number of daycare operators in the United States from 2013 to 2020.* https://www.statista.com/statistics/796425/number-of-daycare-operators-us/.

14. CA AB 506 Requires Child Abuse Prevention Policies for Youth Organizations Volunteers. (n.d.). *Mandated Reporter.* https://mandatedreporter.com/blog/ca-ab-506-requires-child-abuse-prevention-policies-for-youth-organizations-volunteers/.

15. Understanding AB506 [PDF file]. (2021). *MinistrySafe.* https://ministrysafe.com/wp-content/uploads/2022/01/Understanding-AB506-11-18-2021-MS-2-3.pdf.

16. AB 506 Imposes Mandated Reporter Training and Prevention Policy Requirements on Youth Service Organizations. (2021, October 29 .). *Liebert Cassidy Whitmore.* https://www.lcwlegal.com/news/ab-506-imposes-mandated-reporter-training-and-prevention-policy-requirements-on-youth-service-organizations/.

17. Partners. (n.d.). *Abuse Prevention Systems.* https://abusepreventionsystems.com/partners/

18. Pennsylvania State University. (n.d.). *iLookOut for child abuse*. https://webgis.pop.psu.edu/iLookOut/.

19. Somerville D, Dore S, Humphreys KL, Verdiglione N, Zhou S, Hamm R, Fiene R, Kapp K, Levi BH. (2021). State Comparison of Online Mandated Reporter Trainings, *APSAC Advisor*, *34*(1):20-39.

20. Barnett, WC, Panlilio, CC, Mullins, C, Levi, BH, & Humphreys, KL. *Identifying What Works for Whom: Implementation Outcomes Following iLookOut, a Child Abuse Identification and Referral Training Program*. Journal of Clinical and Translational Science, 2023;*7*(1):e205.

21. Humphreys, H. A., Piersiak, C., Panlilio, E. B., Lehman, N., Verdiglione, N., Dore, S., & Levi, B. H. (2021). A randomized controlled trial of a child abuse mandated reporter training: Knowledge and attitudes. *Child Abuse & Neglect, 117*, 105033. https://doi.org/10.1016/j.chiabu.2021.105033

22. Yang, C., Panlilio, C., Verdiglione, N., Lehman, E., Hamm, R. M., Fiene, R., Dore, S., Bard, D. E., Grable, B., & Levi, B. H. (2020). Generalized findings from a randomized controlled trial to a real-world study of iLookOut, an online education program to improve early childhood care and education providers' knowledge and attitudes about reporting child maltreatment. *PLoS One, 15*(1), e0227398. https://doi.org/10.1371/journal.pone.0227398

23. Muniz, C. N., Fox, B., Miley, L. N., DeLisi, M., Cigarran, G. P., & Birnbaum, A. (2019). The effects of adverse childhood experiences on internalizing versus externalizing outcomes. *Criminal Justice and Behavior*, 46(4). https://doi.org/10.1177/0093854819826213

24. Spratt, E. G., Friedenberg, S., LaRosa, A., & others. (2012). The effects of early neglect on cognitive, language, and behavioral functioning in childhood. *Psychology, 3*(2). https://doi.org/10.4236/psych.2012.32026

25. Cowell, R. A., Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2015). Childhood maltreatment and its effect on neurocognitive functioning: Timing and chronicity matter. *Development and Psychopathology, 27*(2). https://doi.org/10.1017/S0954579415000139

26. Gilbert, R., Widom, C. S., Browne, K., Fergusson, D., Webb, E., & Janson, S. (2009). Burden and consequences of child maltreatment in high-income countries. *The Lancet, 373*(9657). https://doi.org/10.1016/S0140-6736(08)61706-7

27. Shields, M. E., Hovdestad, W. E., Gilbert, C. P., & Tonmyr, L. E. (2016). Childhood maltreatment as a risk factor for COPD: Findings from a population-based survey of Canadian adults. *International Journal of COPD, 11*(1). https://doi.org/10.2147/COPD.S107549

28. Lopes, S., Hallak, J. E. C., Machado de Sousa, J. P., & Osório, F. de L. (2020). Adverse childhood experiences and chronic lung diseases in adulthood: A systematic review and meta-analysis. *European Journal of Psychotraumatology, 11*(1). https://doi.org/10.1080/20008198.2020.1720336

29. Soares, A. G., Howe, L. D., Heron, J., & others. (2021). How does childhood maltreatment influence cardiovascular disease? A sequential causal mediation analysis. *International Journal of Epidemiology*. https://doi.org/10.1093/ije/dyab085

30. Peterson, C., Florence, C., & Klevens, J. (2018). The economic burden of child maltreatment in the United States, 2015. *Child Abuse and Neglect, 86*. https://doi.org/10.1016/j.chiabu.2018.09.018

31. Roberts, D. (2022). *Torn apart: How the child welfare system destroys Black families and how abolition can build a safer world*. Basic Books.

32. US Department of Health and Human Services. (2023). *Child Maltreatment 2021*.

33. iLookout for Child Abuse: A Mandated Reporter Training for Head Start Staff. (n.d.). *Early Childhood Learning and Knowledge Center (ECLKC)*. Retrieved from https://eclkc.ohs.acf.hhs.gov/video/ilookout-child-abuse-mandated-reporter-training-head-start-staff See: https://eclkc.ohs.acf.hhs.gov/safety-practices/article/head-start-faqs-ilookout-child-abuse.

34. Levi, B. H., Belser, A., Kapp, K., Verdiglione, N., Mincemoyer, C., Dore, S., Keat, J., & Fiene, R. (2019). iLookOut for child abuse: Conceptual and practical considerations in creating an online learning program to engage learners and promote behavior change. *Early Child Development and Care*. https://doi.org/10.1080/03004430.2019.1626374

35. Levi, B. H., Mundy, M., Palm, C., Verdiglione, N., Fiene, R., & Mincemoyer, C. (2021). Developing an interactive online learning program on child abuse and its reporting. *Journal of Educators Online, 18*(2).

36. Baker, A. J., LeBlanc, S., Adebayo, T., & Mathews, B. (2021). Training for mandated reporters of child abuse and neglect: Content analysis of state-sponsored curricula. *Child Abuse & Neglect, 113,* 104932.

37. Hixenbaugh, M., Khimm, S., & Philip, A. (2022). Mandatory reporting was supposed to stop severe child abuse. It punishes poor families instead. *ProPublica*. Retrieved from https://www.propublica.org/article/mandatory-reporting-strains-systems-punishes-poor-families

38. Kenny, M. C., Lopez-Griman, A. M., & Donohue, B. (2017). Development and initial evaluation of a cost-effective, internet-based program to assist professionals in reporting suspected child maltreatment. *Journal of Child & Adolescent Trauma, 10,* 385–393.

39. Lytle, R. D., Radatz, D. L., Sample, L. L., & Latiolais, R. M. (2021). Do I report this? Understanding variation in the content of state mandatory reporting laws. *Journal of Qualitative Criminal Justice & Criminology*.

40. Miles-Gustave, S., Dannhauser, J., & Banks, C. C. (2023, December 11). New training's aim: To fix disparities in child welfare system. *Times Union.* Retrieved from https://www.propublica.org/article/mandatory-reporting-strains-systems-punishes-poor-families

41. Committee on Child Maltreatment Research, Policy, and Practice for the Next Decade: Phase II; Board on Children, Youth, and Families; Committee on Law and Justice; Institute of Medicine; National Research Council; Petersen, A. C., Joseph, J., & Feit, M. (Eds.). (2014). *New Directions in Child Abuse and Neglect Research. National Academies Press.*

42. Letson, M. M., & Crichton, K. G. (2023). How should clinicians minimize bias when responding to suspicions about child abuse? *AMA journal of ethics*, *25*(2), 93-99.

43. LaBrenz, C. A., Littleton, T., Shipe, S. L., Bai, R., & Stargel, L. (2023). State policies on child maltreatment and racial disproportionality. *Children and Youth Services Review*, *151*, 107048.

44. Laskey, A. L., Stump, T. E., Perkins, S. M., Zimet, G. D., Sherman, S. J., & Downs, S. M. (2012). Influence of race and socioeconomic status on the diagnosis of child abuse: a randomized study. *The Journal of Pediatrics*, *160*(6), 1003-1008.

45. Palusci, V. J., & Botash, A. S. (2021). Race and bias in child maltreatment diagnosis and reporting. *Pediatrics, 148*(1), https://doi.org/10.1542/peds.2020-049625.

46. Ho, G. W., Gross, D. A., & Bettencourt, A. (2017). Universal mandatory reporting policies and the odds of identifying child physical abuse. *American Journal of Public Health*, *107*(5), 709-716.

47. Sweany, N. W. (2020). From Theory to Practice: Evidence-Based Strategies for Designing and Developing Engaging Online Courses. *Syracuse L. Rev.*, *70*, 167.

48. Humphrey, G., Chu, J. T., Ruwhiu-Collins, R., Erick-Peleti, S., Dowling, N., Merkouris, S., & Bullen, C. (2022). Adapting an evidence-based e-learning cognitive behavioral therapy program into a mobile app for people experiencing gambling-related problems: formative study. *JMIR Formative Research*, *6*(3), e32940.

49. Chung, A., Leung, M., Santhanam, R., Kwok, R. K.-W., & Yue, W.-T. (2023). Could gamification designs enhance online learning through personalization? Lessons from a field experiment. *Information Systems Research, 34*(1), 27–49.

50. Ariel, R., & Karpicke, J. (2018). Improving self-regulated learning with a retrieval practice intervention. *Journal of Experimental Psychology: Applied, 24*(1), 43–56. https://doi.org/10.1037/xap0000133

51. Broadbent, J., & Poon, W. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1–13.

52. Ceron, J., Baldiris, S., Quintero, J., Garcia, R. R., Saldarriaga, G. L. V., Graf, S., & Valentin, L. D. L. F. (2020). Self-regulated learning in massive online open courses: A state-of-the-art review. *IEEE access*, *9*, 511-528.

53. Moreno-Marcos, P. M., Muñoz-Merino, P. J., Maldonado-Mahauad, J., Pérez-Sanagustín, M., Alario-Hoyos, C., & Kloos, C. D. (2020). Temporal analysis for dropout prediction using self-regulated learning strategies in self-paced MOOCs. *Computers & Education*, *145*, 103728.

54. Adam, N. L., Alzahri, F. B., Cik Soh, S., Abu Bakar, N., & Mohamad Kamal, N. A. (2017). Self-regulated learning and online learning: a systematic review. In *Advances in Visual Informatics: 5th International Visual Informatics Conference, IVIC 2017, Bangi, Malaysia, November 28–30, 2017, Proceedings 5* (pp. 143-154). Springer International Publishing.

55. Keskin, S. (2019). Factors affecting students' preferences for online and blended learning: Motivational vs. cognitive. *European Journal of Open, Distance and E-Learning (EURODL)*, *22*(2), 72-86.

56. Alvarez, R. P., Jivet, I., Pérez-Sanagustin, M., Scheffel, M., & Verbert, K. (2022). Tools designed to support self-regulated learning in online learning environments: A systematic review. *IEEE Transactions on Learning Technologies*, *15*(4), 508-522.

57. Kerimbayev, N., Umirzakova, Z., Shadiev, R., & Jotsov, V. (2023). A student-centered approach using modern technologies in distance learning: a systematic review of the literature. *Smart Learning Environments*, *10*(1), 61.

58. Navarro, J., Peña, J., Cebolla, A., & Baños, R. (2022). Can Avatar Appearance Influence Physical Activity? User-Avatar Similarity and Proteus Effects on Cardiac Frequency and Step Counts. *Health Communication*, 37(2), 222–229. https://doi-org.proxy-commonwealthu.klnpa.org/10.1080/10410236.2020.1834194.

59. Peng, T.-H., & Wang, T.-H. (2022). Developing an analysis framework for studies on pedagogical agent in an e-learning environment. *Journal of Educational Computing Research*, 60(3), 547–578. https://doi-org.proxy-commonwealthu.klnpa.org/10.1177/07356331211041701.

60. Priniski, S. J., Hecht, C. A., & Harackiewicz, J. M. (2018). Making Learning Personally Meaningful: A New Framework for Relevance Research. *Journal of experimental education*, *86*(1), 11–29. https://doi.org/10.1080/00220973.2017.1380589.

61. Rahill, K. M., & Sebrechts, M. M. (2021). Effects of Avatar player-similarity and player-construction on gaming performance. *Computers in Human Behavior Reports*, *4*. https://doi-org.proxy-commonwealthu.klnpa.org/10.1016/j.chbr.2021.100131.

62. Van Looy, J., Courtois, C., De Vocht, M., & De Marez, L. (2012). Player identification in online games: Validation of a scale for measuring identification in MMOGs. *Media Psychology*, *15* (2), 197 – 221. https://doi-org.proxy-commonwealthu.klnpa.org/10.1080/15213269.2012.674917.

63. Burns K, Gurung R. (2020). A longitudinal multisite study of the efficacy of retrieval and spaced practice in introductory psychology. *Scholarship of Teaching and Learning in Psychology*.

64. Google Cloud. (n.d.). *Best Practices for Running SQL Server on Google Cloud Platform*. Google Cloud. https://cloud.google.com/compute/docs/instances/sql-server/best-practices.

65. Costa, B., Pires, P. F., Delicato, F. C., & Merson, P. (2016). Evaluating REST architectures—Approach, tooling and guidelines. *Journal of Systems and Software*, *112*, 156-180. https://doi.org/10.1016/j.jss.2015.09.039

66. Shih, M.T., Lee, Y., Huang, C., & Chan, L. (2023). "A feeling of déjà vu": The Effects of Avatar Appearance-Similarity on Persuasiveness in Social Virtual Reality. *Proceedings of the ACM on Human-Computer Interaction, 7*, 1 - 31.

67. Jevremovic, A., Zaphiris, P., Adamovic, S., Mottus, M., & Ioannou, A. (2021). Applying information theory and entropy to eliminate errors in mouse-tracking results. *arXiv preprint arXiv:2105.06320*.

68. Zhang, Z., Li, Z., Liu, H., Cao, T., & Liu, S. (2020). Data-driven online learning engagement detection via facial expression and mouse behavior recognition technology. *Journal of Educational Computing Research*, 58(1), 63-86.

69. Abonamah, A. A., Tariq, M. U., & Shilbayeh, S. (2021). On the Commoditization of Artificial Intelligence. *Frontiers in psychology*, *12*, 696346. https://doi.org/10.3389/fpsyg.2021.696346.

70. Mudgal, S. K., Agarwal, R., Chaturvedi, J., Gaur, R., & Ranjan, N. (2022). Real-world application, challenges and implication of artificial intelligence in healthcare: an essay. *The Pan African medical journal*, 43, 3. https://doi.org/10.11604/pamj.2022.43.3.33384.

71. Panlilio, C. C., Famularo, L., Masters, J., Dore, S., Verdiglione, N., Yang, C., ... & Levi, B. H. (2022). Integrating validity evidence to revise a child abuse knowledge test for early childhood education providers: a mixed methods approach. American journal of evaluation, 43(4), 559-583.

72. Panlilio, C. C., Famularo, L., Masters, J., Dore, S., Verdiglione, N., Yang, C., & Levi, B. H. (2022). Integrating validity evidence to revise a child abuse knowledge test for early childhood education providers: a mixed methods approach. *American journal of evaluation*, *43*(4), 559-583.

73. Mathews, B., Yang, C., Lehman, E. B., Mincemoyer, C., Verdiglione, N., & Levi, B. H. (2017). Educating early childhood care and education providers to improve knowledge and attitudes about reporting child maltreatment: A randomized controlled trial. PLoS one, 12(5), e017777.

74. Dong, N. and Maynard, R. A. (2013). PowerUp!: A tool for calculating minimum detectable effect sizes and sample size requirements for experimental and quasi-experimental designs. Journal of Research on Educational Effectiveness, 6(1), 24-67. https://doi.org/10.1080/19345747.2012.673143

75. Dimitrov D, Rumrill P. Pretest-post-test designs and measurements of change. Work. 2003; 20(2): 159–65. PMID: 12671209

76. Woolcock A, Creepy K, Coleman A, Moore J, Brown S. Assessing academic self-efficacy, knowledge, and attitudes in undergraduate physiology students. American Journal of Educational Research. 2016;4(9):652-657.

77. Palmer, S. R., & Holt, D. M. (2009). Examining student satisfaction with wholly online learning. Journal of computer assisted learning, 25(2), 101-113

78. Lund, A. M. (2001). Measuring usability with the use questionnaire12. *Usability interface*, *8*(2), 3-6. Example questionnaire. https://garyperlman.com/quest/quest.cgi?form=USE.

79. Apple et al. (2015). *The Transportation Scale - Short Form (TS-SF)*. In Appel, M., Gnambs, T., & Richter, T. (n.d.). Transportation Scale - Short Form (TS-SF) - PREPRINT (p. 35.08). University of Würzburg. https://www.mcm.uni-wuerzburg.de/fileadmin/06110300/user_upload/Publikationen/Appel-_Gnambs-_Richter-_-_Green_-_TS-SF_-_PREPRINT.pdf#page=35.08.

80. Tarnowski K, Simonian S. Assessing treatment acceptance: The abbreviated acceptability rating profile. Journal of Behavior Therapy and Experimental Psychiatry. 1992;23(2):101-106. doi:doi:10.1016/0005-7916(92)90007-6 ;

81. Dixson, M. D. (2015). Measuring student engagement in the online course: The Online Student Engagement scale (OSE). Online Learning, 19(4), n4.

82. Walsh, K., Rassafiana, M., Mathews, B., Farrell, A., & Butler, D. (2012). Exploratory factor analysis and psychometric evaluation of the Teachers Attitude Scale for Child Sexual Abuse. *Journal of Child Sexual Abuse, 21*(5), 489–506. https://doi.org/10.1080/10538712.2012.689423

83. Amaresan S. What is a good Net Promoter Score? https://bloghubspotcom/service/what-is-a-good-net-promoter-score blog. 2019.

84. Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). sage.

85. Choi, C. (2023). "Deputized Agents:" An Analysis of State Training Curricula for Mandated Reporters of Child Abuse and Neglect (Doctoral dissertation, Columbia University).