

Cognitive Mapping Utilized With An Online Training Program: Developing A Conceptual Framework For Learning and Performance Outcomes in An Online Learning Program

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Introduction

At least 680,000 cases of child abuse (i.e., physical, sexual, and emotional abuse, as well as neglect and imminent risk) are confirmed annually in the U.S., (Administration on Children, Youth and Families, Children’s Bureau, 2012) with strong evidence that the true incidence is much higher (Finkelhor, Turner, Ormrod, & Hamby, 2010; Hussey, Chang, & Kotch, 2006, Kohl, Jonson-Reid, & Drake, 2009; Stoltenborgh, Bakermans-Kranenburg, van Ijzendoorn, & Alink, 2013; Stoltenborgh, van Ijzendoorn, Euser, & Bakermans-Kranenburg, 2011; Stoltenborgh, Bakermans-Kranenburg, Alink, & van Ijzendoorn, 2012; Stoltenborgh, Bakermans-Kranenburg, & van Ijzendoorn, 2013; Sedlak, Mettenburg, Basena, Peta, McPherson, & Greene, 2010).

A vast body of research demonstrates the devastating and long-lasting consequences of child abuse—which includes physical disabilities, cognitive impairment and other neurological damage, mental health problems (depression, anxiety, post-traumatic stress, etc.), maladaptive behaviors (alcoholism, drug abuse, intimate partner violence), as well as further victimization of children (Norman, Byambaa, De, Butchart, Scott, & Vos, 2012, Flaherty et al., 2013; Jonson-Reid, Kohl, & Drake, 2012; Mills et al., 2011; Danese & McEwen, 2012; Shonkoff & Garner, 2012; Hadland et al., 2015). In short, abuse often has a devastating impact on a child's life and the adult s/he becomes.

Young children (aged 0–5 years) are more vulnerable to victimization, accounting for >75% of deaths from abuse, and comprise a greater proportion of cases than older children for all categories of maltreatment except sexual abuse.¹ Yet despite 8-12 million American children being under the care of child care providers (CCPs) (Laughlin, 2013; Laughlin, 2006). CCPs identify less than 0.5% (2,500 of 680,000) of all substantiated cases of child abuse in the U.S. (Administration on Children, Youth and Families, Children’s Bureau, 2012).

Among those who are required to report suspected child abuse (i.e., mandated reporters), Child Care Providers (CCPs)—those individuals who interact with children on a daily basis—are in a unique position to identify and respond to child abuse. In many cases, and especially in rural areas, they may be the only people outside of the immediate family to have extended opportunities to observe children on a daily basis.

A serious issue arises in trying to provide the CCPs with the necessary information and training they need to detect and subsequently report suspected child abuse. In a state such as Maine for example, CCP's face some unique challenges such as great distances across the state that make it difficult to gather for in-person classroom instruction and remote locations often have little or limited computer or internet access as well as real time constraints in having to balance attending to on-the-job demands and training requirements..

Continuing educational offerings teaching about child abuse detection delivered via smartphone technology seems to be one approach that provides professional development opportunities for a rural and geographically dispersed population of learners.

This is critically important because the opportunity for early detection of abuse, CCPs has the potential to help prevent patterns of abuse from taking hold, and can act as key supports for children and families involved in child protection systems (Dinehart, Katz, Manfra, & Ullery, 2013). Yet CCPs face considerable obstacles in reporting child protection concerns, with some CCPs stating that "reporting possible abuse" is the most troubling ethical issue they face in their workplace (Clyde & Rodd, 1989; Feeney & Sysko, 1986).

Studies of CCPs' reporting of child abuse are relatively few compared with the volume of studies undertaken on other mandated reporters with high levels of contact with children (e.g., teachers, nurses, doctors). One comparative study found CCPs less likely to have ever reported child maltreatment compared to other professionals who work with children (Zellman & Bell, 1990), due in part to the minimal education most have received regarding the level of concern and/or circumstances that warrant reporting (Alvarez, Kenny, Donohue, & Carpin, 2004; Kenny, 2007; Carter, Bannon, Limbert, Docherty, & Barlow, 2006). The small body of quantitative and qualitative research examining reporting experiences of CCPs (including kindergarten and pre-school teachers (Sundell, 1997; Bishop, Lunn, & Johnson, 2002) has revealed high levels of uncertainty about the decision to report, perceived "conflicts of loyalty," (Svensson & Janson, 2008) and complexities that have been described as "dancing on the edge." (29) Such themes encapsulate CCPs' desire to preserve relationships with families and/or avoid causing harm, while at the same time meet their legal, professional, and ethical responsibilities. One consequence of such uncertainty and conflict is report latency, with one study finding an average time of 14 months between CCPs having suspicion and making a report (Sundell, 1997)—a situation that, if left unaddressed, risks dire outcomes for many young children.

Unfortunately, an existing curriculum structure and approach tailored to the specific needs of CCPs in rural settings does not exist. While the technology seems to be available and widely utilized, assuming universal access in this context is not assured. However, the largest obstacle appears to be the lack of a comprehensive approach to crafting a curriculum and approach that can be delivered via distance technology that is specifically crafted to the needs of CCPs. We could not envision a CCP watching three hours of child abuse prevention videos at one-time via a smartphone.

We knew that distance education offered a high level of flexibility and that it could be individually tailored for the child care provider, however we knew we faced challenges in defining what was needed in several aspects of the process.

This article outlines a model training program- the *iLookOut for Child Abuse Learning Program (iLookOut)(Core Training and Pinging/Advanced Learning based upon spaced repetition and retrieval to meet individual learner needs)*- which was created to distribute information and resources to child care providers (CCP's) across the state of Maine. This program has been successfully launched in Maine and can serve as an example for non-profits and similar organizations looking to distribute content and trainings via a distance to staff and volunteers.

The Setting and Population

According to 2010 Census information, Maine was considered to be the most rural state in the nation with the majority of Mainers (61.3%) living in areas considered to be 'rural'. With a population of 1.3 million people, 513,542 people were classified as living in urban areas and 814,819 living in rural areas.

To better understand this scope it is important to note that the definition of urban includes populations of at least 2,500; urban clusters (at least 2,500 people and less than 50,000) and urbanized areas (50,000 or more people). In Maine, there are 24 urban clusters, ranging in size from Calais (population 2,504) to Brunswick (population 29,159). "Rural areas" on the other hand, are all those not classified as "urban." The most rural counties in Maine are Lincoln and Piscataquis where 100 percent of the population lives in defined rural areas.

Given that Maine is the most rural state in the Nation, with only three urbanized areas (50,000 or more people)-Portland, Bangor and Lewiston- it comes as no surprise that training and education experiences require flexibility and creativity for the variety of workforces and industries.

Why Child Care Providers (CCPs)?

Among those who are required to report suspected child abuse (i.e., mandated reporters), CCPs are in a unique position to identify and respond to child abuse, as they may be the only people outside of immediate family to have extended opportunities to observe children on a daily basis. With the opportunity for early detection of abuse, CCPs have the potential to help prevent patterns of abuse from taking hold, and can act as key supports for children and families involved in child protection systems (Dinehart, Katz, Manfra, & Ullery, 2013). Yet CCPs face considerable obstacles in reporting child protection concerns, with some CCPs stating that "reporting possible abuse" is the most troubling ethical issue they face in their workplace (Clyde & Rodd, 1989; Feeney & Sysko, 1986).

Studies of CCPs' reporting of child abuse are relatively few compared with the volume of studies undertaken on other mandated reporters with high levels of contact with children (e.g., teachers, nurses, doctors). One comparative study found CCPs less likely to have ever reported child maltreatment compared to other professionals who work with children (Zellman & Bell, 1990), due in part to the minimal education most have received regarding the level of concern and/or circumstances that warrant reporting (Alvarez, Kenny, Donohue, & Carpin, 2004; Kenny, 2007; Carter, Bannon, Limbert, Docherty, & Barlow, 2006). The small body of quantitative and qualitative research examining reporting experiences of CCPs (including kindergarten and pre-school teachers (Sundell, 1997; Bishop, Lunn, & Johnson, 2002) has revealed high levels of uncertainty about the decision to report, perceived "conflicts of loyalty," (Svensson & Janson, 2008) and complexities that have been described as "dancing on the edge." (29) Such themes encapsulate CCPs' desire to preserve relationships with families and/or avoid causing harm, while at the same time meet their legal, professional, and ethical responsibilities. One consequence of such uncertainty and conflict is report latency, with one study finding an average time of 14 months between CCPs having suspicion and making a report (Sundell, 1997)—a situation that, if left unaddressed, risks dire outcomes for many young children.

In Maine, child care providers (CCP's) face some very unique challenges as an industry which makes professional development especially difficult. Distance education and online approaches offer just the creative solution for desired and often required professional development opportunities.

Like other states, Maine has different types of child care providers. For purposes of the *iLookOut* project, 1878 licensed early care and education programs were identified in the State. To maintain a licensed status, child care providers are required to complete yearly professional development (18 hrs/yr for part-time CCPs, 30 hrs/yr for full-time).

Family Child Care Providers: Over half (58.4%) were considered to be Family Child Care Providers. In Maine, family CCP's can be licensed to provide care for up to 8-12 children in their home (Information for Parents (2018). Traditionally, these family-based providers frequently work with little to no "down time" and with long hours that can easily stretch over a 10 hour day. Because these home-based programs are small settings where only one maybe two child care providers work, obtaining required trainings and professional development is often difficult.

Child Care Centers: In 2016, approximately 32% of licensed programs were, "facilities licensed as a child care center [to] serve more than three children under the age of 13 and are not a place of residence". In Maine, "the average child care center cares for 35 children". (Information for Parents (2018) By design, center based child care programs often have a bit more flexibility in being able to substitute staff for professional development opportunities. However, staff and educators at child care centers programs have a labor intensive job with few breaks that can be coupled together during normal business hours.

Head Start & Nursery School Programs: Other types of early care and education program are Head Start programs (approximately 6% of CCP's in Maine) and Nursery Schools (approximately

3% in Maine). Defined as a “comprehensive early childhood development program for children, ages 3-5”, Head Start programs serve children “whose family income is at or below the poverty level or who have a disability” (Information for Parents, 2018) whereas nursery schools “offer programming to children, ages 3-7, for no more than 3 1/2 hours per day, 2-5 days a week. The preschool programming often provides a structured curriculum to an average of 10 children in a group” (Information for Parents, 2018)

Despite the differences in programmatic structure, capacity and staffing, childcare providers work long hours with children who require extensive care and supervision. As such, it will come as no surprise that when childcare providers are done with work, they are done. There is often little interest in trying to get to an evening professional development session. Weekend time offer an alternative, but this isn’t always convenient either. Online or distance education, such as *the iLookOut for Child Abuse Learning Program*, becomes an appealing alternative where the professional development opportunity/training session can be brought to the childcare provider in the convenience of their own home and on their own terms.

Approach

Given the population of CCPs in Maine and the acute need for mandated reporter training and our desire to deliver the instruction over a distance via computer and smartphone technology, we undertook a process of cognitive mapping to identify and address the necessary elements for our distance learning approach to be successful.

A large part of that process was the development of a cognitive map to layout curricular requirements. We began by identifying what we would need to deliver and when the content would need to be delivered. We knew there would be obstacles and we wanted to identify and address those obstacles in the design process before we deployed the program. These obstacles were present in both the Core Training as well as the Pinging/Advanced Learning approaches.

To better understand the requirements, we undertook a cognitive mapping exercise. We knew it was critical to ensure that we would have all of the elements covered when we rolled out the *The iLookOut for Child Abuse Learning Program (iLookOut Core Training)*.

It is important for the reader to be cognizant of the difference between the *iLookOut Core Training* and the *iLookOut Pinging/Advanced Learning*. *The iLookOut Core Training* is a more standardized approach to training in that all the participants receive the training in a similar fashion. In *iLookOut Pinging/Advanced Learning* is more of an individualized approach to learning based upon specific content needs of each participant determined by their knowledge test score. Based upon this score, specific modules can be sequenced in particular content sequences and timing. In the future the cognitive map can be so constructed to be capable of determining specific algorithms that enhance reinforced learning via spaced retrieval and repetition.

Cognitive Mapping

Cognitive Mapping has been used in many different venues and as a tool in several areas, such as, planning health research (Stadler, et al, 2013), and engineering (Dixon & Lammi, 2014) are two examples in which very complex relationships can be reduced to key elements that can be easily manipulated to make certain that all relationships can be seen and measured. The purpose of this section is to demonstrate its use in the online training program "*iLookOut for Child Abuse Learning Program (Core Training)*" and subsequent "*Pinging/Advanced Learning Program*" for child care providers by demonstrating how the cognitive map was created as based on the previously discussed framework. The program was then delivered as a blueprint for what a trainee would learn, and what the curriculum needs to cover via child abuse prevention learning modules.

Cognitive Mapping was first introduced in 1948 by Edward Tolman, an educational psychologist, (Tolman, 1948). Originally, it was used to explain how rats learned the locations of rewards in a maze and as such generated a practical model for mapping the environment.

The advantage of Tolman's work is a move away from a simple S-R relationship and the demonstrated "latent learning" with rats in maze learning where non-reinforced rats still learned about the maze by exploring the maze. By including a cognitive component, we begin to see the move toward a social cognitive framework by including cognition as an important aspect of learning. By bringing in cognition, we are able to further explore learner characteristics that help improve learning (e.g., self-regulated learning components of goal-directedness, motivation, goal feedback, etc.). An important component of learning is outcome expectations (Schunk & Zimmerman, 2006), which is rooted in Tolman's concept of field expectancies. According to this notion of expectancies, a learner is able to anticipate contiguous relations between stimulus and response. For example, lightning is followed by thunder. Field expectancies helped people form cognitive maps, which are internal representations of these expectancies along with the selection of actions needed to help learners attain their goals.

The notion of latent learning is important because learners may not demonstrate adequate learning and performance outcomes during the process of learning. Yet the learning activity is important for acquisition of knowledge that learners may use at a later time. This could be at the summative assessment period or, more relevant for our participants, at the time that they are in classrooms and working with infants and toddlers. According to a Social Cognitive framework, learners will act in a manner that is believed to be successful and will orient toward viable observational or learning models that will provide the important skills or tools to ensure success.

Thus, cognitive maps help with this process. This is where the cognitive maps developed for *iLookOut* can help so that by understanding how we guide our learners through a more efficient development of this map, rather than relying on individual differences in map formation, we can ensure that learners can develop the necessary and more efficient means to respond to abuse and neglect scenarios in the classroom (i.e., displaying latent learning).

By definition "cognitive maps" are mental or conceptual models, "thinking maps" that like other forms of cartography maps territory. But here it is cognitive "territory" rather than geographic terrain that is being characterized. Sometimes, cognitive maps provide a linear progression of a concept, or the relationships between various factors. But they also can serve a developmental purpose, helping people (be they researchers, policy makers, teachers, or learners) develop a deeper understanding of how different elements are (or should be) related to one another.

There are many applications of cognitive maps, here are some examples that have been used in the past: 1) Perceptual, such as - a. Inquiring, investigating, gathering data or information; b. Noticing, attending to, becoming aware of; c. Differentiating, distinguishing, discriminating. 2) Cognitive, such as - a. Organizing data, sorting, chunking, finding patterns and relationships; b. Interpreting data, understanding it, making sense of it, what it means; c. Analyzing data, reasoning about it; d. Troubleshooting, diagnosing; e. Drawing conclusions; f. Framing, reframing; g. Illuminating, insights, clarity; h. Estimating probability, confidence levels, degrees of certainty. 3) Evaluative, such as - a. Evaluating, assessing, judging anything; b. Evaluating performance, effectiveness, success (relative to a Purpose); c. Predicting likelihood and degree of future success; d. Assigning importance, urgency, priority; e. Providing feedback, including monitoring and measuring progress. 4) Volitional, such as - a. Identifying desires; b. Defining or clarifying purposes; c. Planning. 5) Behavioral, such as - a. Acting, behaving, performing (relative to a Purpose); b. Implementing a plan (performance relative to a Purpose); c. Communicating; d. Learning knowledge; e. Building or improving skills; f. Developing.

We used cognitive mapping for the *iLookOut* program for the following purposes: coordinating learning knowledge, implementing a plan, predicting likelihood and degree of future success, providing feedback, monitoring and measuring progress, evaluating and assessing achievement, organizing data, and finding patterns. In short, we used it to identify critical areas of our project that we knew had to be further defined to insure success.

Here are the details of how the process was developed and applied to an online training program to help prevent child abuse: *iLookOut for Child Abuse Learning Program*.

The cognitive map built on the earlier discussed framework helps to organize the development of the *iLookOut* curriculum and will focus on the following elements as delineated in the above topical list:

-Discriminate —i.e., to distinguish different concepts learning points

-Finding patterns and relationships —i.e., to demonstrate associations between various components

-Measuring progress —i.e., to map learners' actual progress through different stages of learning (particularly with regard to the pinging, which is sequential)

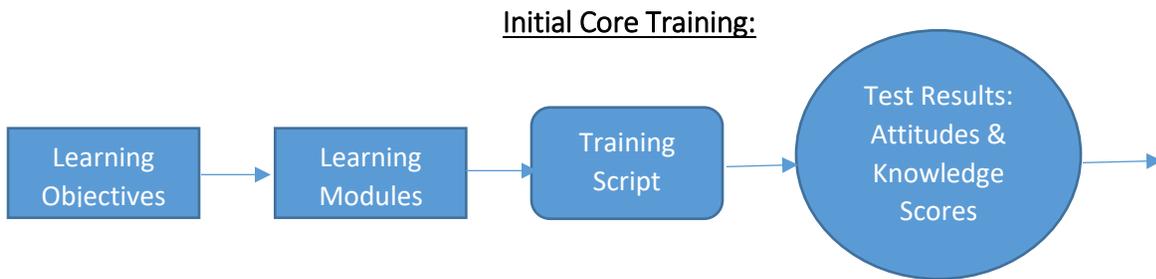
-Clarifying purposes —i.e., to clarify the purposes of various components of the learning program, pinging activities, etc.

-Building or improving skills —i.e., to create a framework for how learners will progress through various activities so as to develop their skills

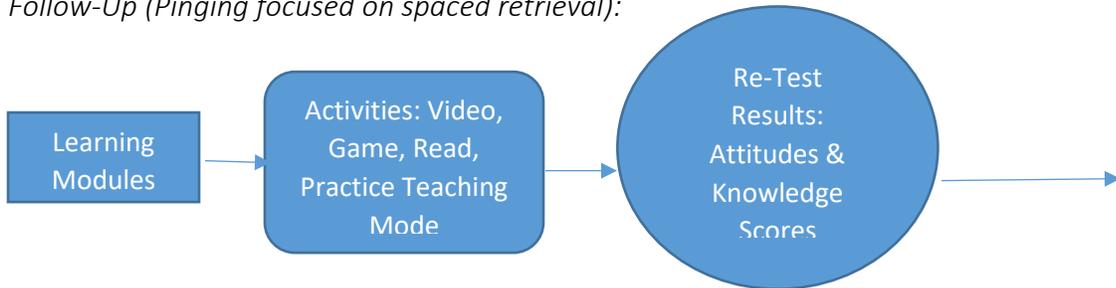
Methodology

This section will provide an overview of and detail about the methodology used in creating the cognitive map and the schematic formatting in moving from learning modules to actual activities utilized online. Figure 1 provides an overview cognitive map in summary format to demonstrate how all the key elements to the *iLookOut for Child Abuse Learning Program (Core Training and Advanced Reinforced Training)* fits together into a unified whole.

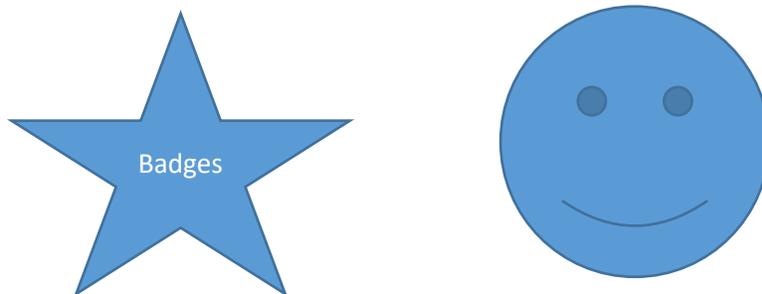
Figure 1 - Cognitive Map in Summary format.



Follow-Up (Pinging focused on spaced retrieval):



Badging and Behavior Change



And....behavior changes

The above cognitive map depicts moving from the initial learning objectives and all the subsequent steps for developing the learning modules, training script, and activities in the *Core Training*. It also shows how these various components are assessed via attitude and knowledge assessments. The following figures provide the details of the sequencing presented in the above cognitive map-providing a blueprint to follow in developing the actual activities used in the learning program and follow-up reinforcement (spaced repetition and retrieval).

Figures 2 and 3 provide the details of the mapping that occurred from learning modules and objectives to the actual activity plans for ping-pong.

Figure 2 - Template/Chart of Learning Modules, Objectives

Figure 2 clearly shows the relationship between the various learning modules, objectives and the assessment process used in the training program. This figure helps the curriculum planner to make certain that all the learning objectives of the program are within the script and learning modules and will be accessed via knowledge or attitudinal tests.

| Learning Objectives (LO) of <i>iLookOut</i> | Script Intervention & Learning Modules (LM) | Learning Module Type | Knowledge Test (KT) Conceptual Areas | Attitudinal Items |
|---|---|---|--------------------------------------|-------------------|
| Orientation to <i>iLookOut</i> | (LM-0) "Learning Module Orientation" | Optional Slide | | |
| | (LM-2) "Key Questions" | Slide with Voice Over | | |
| | (LM-3) "State Specific Requirements" | Slide with Voice Over | | |
| | (LM-4) " <i>iLookOut</i> Course Worksheet" | Slide with Instructions and Resource File Handout #1: <i>iLookOut</i> Course Worksheet | | |

Based upon the learning that occurs in the above figure, follow-up remediation via the Pinging Program is delivered in which short and targeted activities used to reinforce any learning that may be lacking based upon the scores from the knowledge and attitudinal assessments being administered after the Core Training. These are presented in figure 3 below.

Figure 3 - Activity Plans Chart for Pinging

Figure 3 demonstrates how the learning modules can be sequenced into online learning activities that help to support these modules and objectives. This figure lists the topic for each week along with the module taken from Figure 2 along with the activity name and actual location within the learning platform and the primary teaching mode.

| TOPIC | WEEK | MISSION/MODULE NAME (CODE) | MISSION/MODULE NAME (FRONT END) | ACTIVITY NAME | mLevel LOCATION | PRIMARY TEACHING MODE |
|-------------------------|------------------|----------------------------|----------------------------------|---------------------------------|------------------|-----------------------|
| If You Don't Who Will | Learning Program | LP1 | "If You Don't, Who Will" | If You Don't Who Will | PathFinder | Video |
| | | | | Certificate of Completion | External Link | |
| (1)Types of Child Abuse | 1 | Y1M1a | Director Message: Types of Abuse | What to Expect: Month 1 | PathFinder | Game |
| | | Y1M1 | Module1 | <i>iLookOut</i> Pinging Program | Pathfinder | Game |
| | | | | Welcome Video | Go Animate Video | |
| | 2 | Y1M2 | Module 2 | Types of Abuse | Pathfinder | Video |
| | | | | Video: Types of Abuse | Go Animate Video | |
| | 3 | Y1M3 | Module 3 | Video Check -in: Types of Abuse | Block Party | Reading |
| | | | | Child Abuse Reading | External Link | |
| | 4 | Y1M4 | Module 4 | Check In: Types of Child Abuse | Checkpoint | In-Practice |
| | | | | In Practice: Types of Abuse | custom Task | |

| | | | | | | |
|--|--|--|--|-----------------------|------------------------|--|
| | | | | Check In: In Practice | External Link (RedCap) | |
| | | | | Congratulations ! | Custom Task | |

As a result of the cognitive mapping process several areas of focus arose. These areas included: **instructional design** (designing the right content, format and information to include in the curriculum), **motivational issues** (thinking about how to motivate employees working from a distance to participate and actively engage) and **technological issues** (thinking about how to leverage technology that is accessible and available for all potential learners, near and far).

The following sections outline how we approached those major findings based on the results of the cognitive mapping process.

INSTRUCTIONAL DESIGN

Instructional design quickly became a focus area as a result of the cognitive mapping process and in further investigating instruction design we determined that we would need to deliver targeted instruction over-time to the learners. This lead us to explore learning techniques such as *spaced retrieval*, *retrieval practice*, and *mastery learning*. knew that to deliver the right level of instruction we would be required to design the right mixture of informational material (e.g., articles, handouts, web-links, etc.), practice questions, educational cues, and triggering information, and activities requiring learner responses.

The design of the instruction is an important aspect of creating iLookout. There is a large body of research spanning decades indicating the effectiveness of spaced practice and spaced retrieval for learning (Ausubel, & Youssef, 1965; Caple, 1996; Kerfoot, 2010)). One element that seemed to be missing was a systematic approach to designing an overall curriculum map to determine the delivery of the right mixture of practice questions, triggering information, articles and other related materials provided at spaced intervals over time. We knew that by combining the cognitive mapping process with the instructional design concepts of spaced retrieval, retrieval practice, goal orientation and mastery learning that we would have a solid foundation for the iLookout program.

Spaced Retrieval

The development of the Web, mobile technologies have allowed small bits of content delivered via technology to be provided to learners using the concept of ***spaced retrieval***. Broadly, this concept involves providing students with course content spaced over time and has been shown to be an effective tool for aiding student retention (Carpenter & DeLosh, 2005). In contrast, mass practice-where a learner attempts to learn a large amount of content all at one time, is a

common methodology used in many professional development settings. One problem with mass practice is that the succeeding and preceding content can interfere with the learning of the new content and learner fatigue can set in. *iLookOut* utilizes spaced retrieval to give learners the opportunity to process new information, and then reconsider it before having to simply move on. Though much of education is delivered en masse _i.e., providing learners large amounts of content all at one time– it is well established that... By contrast *iLookOut* leverages the emerging understanding (citations) that by providing learners new information in smaller chunks, with intervals in between.

Spaced retrieval is most effective when engaging learners with content over an extended period of time and when reinforcement of the content is important for learning and application. The use of spaced retrieval appears to be growing in popularity with the advent of such computer adaptive instructional models as ALEKS (Doignon & Falmagne, 1985) and LearnSmart (McGraw-Hill, 2013).

The greater the amount of spacing between retrieval events, the greater the potential benefit to retention. Spaced retrieval helps learners retain access to memorized information over long periods of time because the spacing promotes deeper processing of the learned material. Ideally, the time between the learning events is greater than 24 hours, but shorter times have also been found to be effective. As long as eight years after an original training, learners whose practices were spaced showed better retention than those who practiced in a more concentrated time period (Clark & Mayer, 2011).

As illustrated in Fig (#), the *iLookOut* program offered participants weekly released modules that released 2-4 individual activities (readings, games, videos, etc) to be completed in succession. Once completed, the modules could be reviewed but learners could not proceed forward until the following week's release. Successful completion of each weekly module unlocked a pathway to eventually earning a badge, which was earned in 3 sections (see Fig (3) for image of badge).

Retrieval Practice

By design, retrieval practice requires learners to recall or retrieve information that they have learned. . Unlike other programs where students are asked to re-read or re-listen to information over and over with no opportunity to practice or check in, the *iLookOut* program uses weekly module “knowledge checks” as a means of requiring students to recall previously learned information.

As scientific literature reveals, the benefits of retrieval practice have been known for at least 100 years and have been demonstrated with many diverse groups (Larsen et al., 2009). Modern computer systems with their ability to record student answers and keep track of performance, allows the learner to engage in the process and answer questions as they are presented in an engaging manner.

Retrieval practice improves student recall performance (Dobson, 2013). Using quizzing as a technique for learning forces the learner to recall content learned previously, and the act of retrieving information from memory actually alters the retrieved memory by strengthening the existing memory trace and/or creating additional retrieval routes. One consequence of these changes is that the probability of successful retrieval in the future is increased, making testing a potent mechanism for enhancing long-term retention (Roediger & Butler, 2013). In essence, the quiz is the game element the student encounters, and answering the questions triggers additional game elements like points or badges.

An example of this technique, is when a learner receives a quiz question on a daily basis and he or she answers the question. If the learner answers incorrectly, he or she is provided with immediate corrective feedback based on the answer. The question is then placed back into the pool of questions and will be given randomly to the learner in the future.

Because retrieval practice within the context of seems works best when content is required to be memorized and recalled. the iLookOut Program design uses a method of retrieval practice by first offering information in the form of a reading, video or simple game and then following it with a Knowledge Check Activity designed to review and reinforce the previous information learned (i.e a 1 page article on Types of Abuse followed up with 10 questions (T/F or Multiple Choice) based on the information found in the reading.)

Goal Orientation

For the overarching iLookOut project and the specific Pinging Program, there were two types of goal orientation to be considered: performance orientation and mastery orientation (Blair, 2012). By design, each of these two types of goal orientation has an impact on how achievements awarded to learners should be constructed. Generally, students who favor a performance orientation are concerned with other people's assessment of their competence whereas students who have a mastery orientation are concerned more with improving their proficiency.

To balance student predisposition towards performance orientation, the iLookOut program offers an effective learning environment to instill a mastery orientation in the goals and feedback offered.. By creating a mastery orientation, iLookOut learners are offered chances to readily accept errors and seek challenging tasks, providing them with the opportunity to develop their competencies. When given mastery goals, learners will have higher self-efficacy and utilize more effective strategies. Students given mastery-oriented goals perform better on complex tasks (Winters & Latham, 1996). To foster mastery orientation, learners should be required to earn achievements that acknowledge effort put forth and support them during challenges. Errors and mistakes should be treated as opportunities to provide diagnostic feedback and encouragement.

Mastery Learning

Simultaneously the goal and the process of learning with a large-scale curriculum are progression through content. The learner masters an enabling objective on his or her way to eventual mastery of the terminal objective. Underlying this mastery learning approach is a philosophy asserting that under appropriate instructional conditions virtually all learners can master what is taught (Block & Burns, 1976; Bloom, 1971). The basic concept of mastery learning is that instruction is organized into discrete units where it's possible to master the discrete unit before moving to the next unit. The method of moving through the instruction is based on ungraded assignments with formative evaluation as a tool for identifying what is learned and what is yet to be learned and then providing additional support for concepts that have not been mastered (Bloom, 1971; Melton, 2008).

Mastery learning provides an approach that recognizes that aptitude for learning may be more closely linked to time and perseverance than to ability (Bloom, 1971; Melton, 2008). This is similar to the idea underlying the concept of criterion-referenced tests, which is to assess the performance of each test-taker without regard to the performance of others (Shrock & Coscarelli, 2007). There is no limit to the number of learners who can succeed on a criterion-referenced test, as opposed to a norm-referenced test, which strives for a bell-shaped distribution curve, meaning some students pass and others fail regardless of mastery on the test. The curriculum design process used for iLookOut uses criteria and levels of mastery to advance the learner from one element of the instruction to the next.

MOTIVATIONAL APPROACH

As a result of the cognitive mapping process, we determined that motivation was a critical requirement because we knew that even if we laid out a great curriculum, if the CCPs did not participate in the program, our efforts would be lost. The motivational elements of the model are built on Self-Determination Theory utilizing gamification and badging.

Self-Determination Theory

The motivation foundation for tiLookout is based on the Self-Determination Theory. Self-Determination Theory (SDT) is a macro-theory, which explains human motivation to perform a task or an activity as being internally driven as opposed to the externally driven theory of operant conditioning (Ryan & Deci, 2000a; Ryan & Deci, 2000b). The theory has been used to describe motivation in a broad range of human activities including sports, healthcare, religion, work, and education.

Self-Determination Theory addresses factors that either facilitate or undermine motivation. The theory has several sub-theories including cognitive valuation theory, which proposes that events and conditions that enhance a person's sense of autonomy and competence support intrinsic motivation. And that factors that diminish perceived autonomy or competence undermine intrinsic motivation.

One of the first elements of SDT is autonomy which is the feeling a person has that they are in control and can determine the outcome of their actions. It is the feeling of having control over one's actions and is an integral part of SDT.

Another key aspect of the theory is competence. The concept of competence is defined as a need for challenge and a feeling of mastery. Cognitive evaluation theory proposes that factors enhancing the experience of competence, such as the opportunity to acquire a new skill or the chance to be appropriately challenged enhance perceived competence and, in turn, are intrinsically motivating.

The third major element in SDT is the concept of relatedness. Relatedness is experienced when a person feels connected to others. This can happen most often in an online multiplayer game, but it can also happen when two or more friends are playing a video game together. Researchers have found evidence that “the psychological ‘pull’ of games is largely due to their capacity to engender feelings of autonomy, competence and relatedness, and that to the extent they do so they not only motivate further play, but also can be experienced as enhancing physiological wellness.”(Ryan, Deci & Przybylski (2006)

In terms of our approach to the iLookout program, there is evidence to indicate that “badges, leaderboards, and performance graphs positively affect competence need satisfaction, as well as perceived task meaningfulness, while avatars, meaningful stories, and teammates affect experiences of social relatedness.”(Sailer et. al, 2017).

Badging

This information informed our decision to develop and use Badges to show progress to the child care providers in the Pinging Program. As the curriculum unfolds over a long period of time, it was important to demonstrate to the learner (in the iLookOut case, the individual CCP), that they were indeed, making progress toward mastery of the content and skills to be learned. The act of receiving a badge for making progress through the content provides a visual indication of progress. The design of the curriculum orients the learner to where they are in the instructional process, where they are going, and how much further they have to go until the end. The concept is that the learner is able to “see” progress and receives tangible recognition of their progress in the form of a badge and a level indication (Kapp et al., 2013).



Fig (#)

Gamification

Gamification has been defined as the “use of game design elements within non-game contexts” (Deterding, Dixon, Khaled & Nacke, 2011, p. 1). Gamification has also been described as game

based elements that are utilized in a non-game settings (Dominguez et al., 2013) for example, using achievements, badges, or experience points in corporate educational efforts. Al-Azawai et al. (2016) make the distinction between games and gamification techniques by explaining that gamification actually makes learning a game whereas game based learning is using a game during learning. For an instructional context, the most relevant definition is one that combines elements from the above definitions and defines gamification as “using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2012, p. 10).

The central idea is to take the ‘elements of games, and to implement these in real-world situations, often with the goal of motivating specific behavior within the gamified situation.

To incorporate gamification into an otherwise challenging topic, the iLookOut project used techniques of gamification to deliver the content of child abuse awareness, identification and prevention to the CCP’s in a variety of approaches centered on using game elements for motivation. This includes providing points, stars, badges and an ‘unlocking’ and unveiling of the pathway to the Badge for progress. Future courses will include both individual and group leaderboards

THE TECHNOLOGY

From the beginning because we were trying to train a rural, geographically dispersed group of CCPs in Maine, we knew technology would play a large role in the iLookout program. We knew distance education would be critical.

The technology aspect of this model involves selecting a solution that contains an easy to use and easy to access application via a smartphone and a tool that provides the ability to access data to determine elements. The importance of collecting important data items are twofold. The first is focused on access. How frequently do individuals access the distance learning opportunity? What times of day and what type of learner accesses it most often? While it is clear that there appears to be great promise in using mobile technologies for educational purposes, the persistent obstacle of access remains. Not surprisingly, access is an issue in developing counties and, more surprisingly, can be an issue even in developed counties.

The second focus of collecting data is the measurement of learning. Research questions associated with *iLookOut* explored whether it appeared that individuals utilizing the technology were learning via the technology and applying that technology to the identification and proper reporting of child abuse cases. There is a dearth of research on the use of hand-held smartphone technology to provide workers with direct instruction on dealing with the issue of identifying possible signs of child abuse. The technology chosen for this project needed to be able to record scores, attempts at answering questions and the actual difference in answers from one attempt to another.

To address these issues and realities, the solution in the *iLookOut* program combined a mobile application delivered via a smartphone combined with a databased and backend, which collected the data. Child care providers logged into the website to register and begin the program and then, at the end of the online learning module, were asked to download an application to their smartphone device to enable them to continue with the instruction. To avoid people skipping this part, we required the download to receive the initial certificate of completion and first badge

From a development perspective, the requirement was to be able to easily and quickly add information and different types of learning engagement elements such as different game types, branching choices and even text or video. Additionally, we didn't want the addition of the data to require programming or development knowledge. For these reasons, we initially chose an off-the-shelf solution known as mLevel which provided templates for inputting content and appeared to have a distribution system which would allow CCPs to download an app to their phone and use the app to access course content.

Result

The *iLookOut for Child Abuse Learning Program (iLookOut)* offers interactive, online modules (www.ilookoutproject.org). In addition to a comprehensive three-hour core-training, *iLookOut* offers licensed child care providers in Maine a follow up advanced training ("Pinging Program") using a technology approach called "Pinging". This advanced training program sends content to learners in a format that is a combination of micro-learning and gamification. The content consists of short (three to five minute) reinforcement training interactions provided via laptop computer, tablet or smart phone over the course of 52 weeks

Conclusion & Implications

This article briefly describes a model for designing, developing and delivering a curriculum in a distance learning environment learners in a childcare setting that was developed using a cognitive mapping process and that revealed the need for a focus on instructional design, motivational strategies and the application of the right technology.

The discussion of distance learning experiences is rarely conducted in a non-academic and non-business setting. This model provides a process and procedures for government agencies and quasi-governmental agencies to design, develop and deliver a comprehensive curriculum to reinforce desired behaviors with mandated training requirements.

The paper discussed the theory, pedagogy, and utilization of cognitive mapping as an organizational and conceptual model to clearly identify key needs for delivery and development of an effective curriculum to help CCPs identify signs of child abuse. The cognitive mapping process was important because it proved more flexible than utilizing more linear modeling, such as developing an outline.

Sharing this process is to demonstrate to other researchers who may be interested in doing assessments or evaluations of professional development, training or technical assistance interventions a process that can be used empirically to determine how the various components within an online program are related. Based on the process, it will provide potential paths to assessing the best combination of activities in an individualized learning paradigm for each learner.

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