# Research Summary:

## Evaluations Comparing Virtual to Classroom Delivery & Measuring Transfer of Learning (TOL) in Virtual Trainings

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# Executive Summary

## I.    Evaluations that Compare Virtual to Classroom Delivery

*Summary of Findings:*

Overall, the research points to virtual and classroom delivery being fairly equal in efficacy. Virtual delivery occasionally had better outcomes, but the effect size was typically minimal, if any. However, research comparing purely online delivery, classroom delivery, and hybrid delivery reveal a blended learning combination that incorporates content interaction and learner-instructor interaction to specialize one's experience afforded the best learner results.

When reviewing virtual versus classroom delivery, important themes arose. There was no significant difference in subject achievement when virtual instruction utilized opportunities for personal feedback and discussion with the instructor/trainer. Plus, tools and features to engage with the content and allow for participant self-assessment are key components to better learning. The research found both virtual and classroom delivery produce comparable training participant satisfaction scores (under similar standards) throughout the literature as well.

Multiple perks were attributed to the virtual experience such as innovative technology use for new and exciting content delivery, distance-proximity (reduced travel time/costs), flexible schedules, additional access to materials for review, opportunities for more spaced learning options, and the ability to better tailor to an individual's needs (that classrooms may not allow).

On the other hand, there were downfalls in disparate access to the internet or technology and sometimes less participant attention in virtual settings depending on virtual course length (when longer) and interaction capabilities (when less). A few research studies suggest learning gaps in specific subject areas and socioeconomic disparities with virtual delivery versus in-person instruction.

The right mixture of human and technology seems most beneficial, virtual training may be more appropriate for certain content, some learners may be more able to take advantage of online courses, and the quality of virtual learning seems to be improving over time with new technologies, a stronger research base, and evidence-based practices emerging on how to make virtual training more effective and impactful.

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## II.    Recommendations for Making Virtual Better than In-Person Learning

*Summary of Findings:*

In contrast to the first section of this research summary, recent findings by NeuroLeadership Institute (NLI) indicate that virtual learning, when done right, can be dramatically more effective than in-person training/workshops. In fact, an analysis of the likelihood of people taking action on a learning program showed that a "smart virtual learning program" was around six times more likely to get people to take action than when learning is delivered in person.

NLI found when deployed correctly, virtual learning is capable of activating higher levels of attention, generation, emotion, and spacing, factors key to more effective learning. Based on its research, NLI also shares the four most common mistakes made with virtual learning and what to do instead.

Additionally, VitalSmarts reports their recommendations on the right and a wrong way to deliver virtual learning. Their article includes best practices for designing virtual training to potentially deliver better results than in the traditional classroom experience.

Lastly, one systematic review of the research on the use of game-based technology in virtual training is included, which is evidence shows can effectively engage the newest generations of learners as well as hold promise for fostering critical thinking skills and other 21st century skills.

## III.    Existing Tools on How to Measure Transfer of Learning (TOL) in Virtual Training

*Summary of Findings:*

Transfer of Learning (TOL) is often synonymous with the transfer of training. In the research reviewed, few results came up specifically pertaining to validated questions or tools for measuring TOL in virtual training. However, many methods used in the transfer of traditional training may be applicable for online training as well.

The first resources summarized include how definitions of TOL, factors that support training effectiveness, and the extent to which knowledge, skills, and attitudes learned in training are applied on the job and the subsequent maintenance of them over time. Some articles argue the most common transfer approaches have not yet been researched with sufficient rigor or intensity to enable full certainty about how to engineer the transfer of learning success.

It is important to note that some of the resources providing guidance for general TOL measurement may not have the same applicability to virtual learning settings. However, it is probable that TOL measurements for traditional learning settings could be generalized to proficient virtual programs (considering findings of generalizability shared in Section 1 above).

Some resources summarized provide guidance towards current review and future investigation of the best approaches, as well as specific questions, including suggestions on what to consider if forming one's own TOL measurement tool.

A few examples of specific TOL metrics/tools showing validity and potential applicability for virtual training are also reviewed including NeuroLeadership Institute's Behavior Change Percentage (BCP) Metric, Learning Transfer Systems Inventory (LTSI), Learning-Transfer Evaluation Method (LTEM), the Success Case Method, and Factors Influencing Training Transfer (FITT).

## I.    Evaluations that Compare Virtual to Classroom Delivery

### A.  *Overview: The Research on Virtual Learning[1]*
- Many researchers divide online interaction into three types: student-content interaction, teacher-student interaction, and student-student interaction.
- A substantial amount of research in virtual learning has been in the context of higher education. Online learning programs for undergraduates and professionals have expanded dramatically over the past decade, and many researchers have taken advantage of such programs to research instructional design choices and to compare online courses to face-to-face courses directly. Research on K-12 programs, however, is sparse, despite the increasing popularity of K-12 virtual learning programs.
- Meta-analyses suggest online courses are at least as effective as face-to-face courses.
  - Blended learning courses, however, tend to be the best of all, with the important caveat that students also tend to perform more work in blended learning courses.
- Of course, whether any given online learning experience is equivalent to a given face-to-face experience depends on several factors. There is a huge variation in online programs.
- To ensure an online course is successful experienced online teachers and researchers suggest something simple: get the basics right first.
  - Organize the material, provide a calendar, minimize tech problems, set clear expectations, provide frequent check-ins.
- To make the virtual learning environment feel more like a community, it helps to use "social presence cues:" call people by name, use photos or avatars, provide personal anecdotes and encouragement.
  - Although there is not sufficient evidence to link these techniques to learning outcomes, they do seem to encourage student participation and result in higher student satisfaction.
- One of the major risks of virtual learning is for the lowest-performing students.
  - For instance, one study explored whether an online course could help students recover credit after failing an algebra course by randomly assigning 1,000 students to online learning and face-to-face conditions. Unfortunately, students in the online course reported the

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[1]Boser, U. (2020).The Research on Virtual Learning. *The Learning Curve.* https://www.the-learning-agency-lab.com/the-learning-curve/what-does-the-research-say-about-online-learning

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class as more difficult than those in the face-to-face course, were less likely to recover credit, and performed worse on a final algebra test.

○ Another study explored a large dataset from DeVry University, which uses a large number of online classes that have the exact same structure as their face-to-face classes (same instructors, same textbooks, same homework materials, same exams, etc.). Students in the virtual learning conditions had lower GPAs for the class and lower subsequent GPAs in future classes. It's the lowest-performing students, however, who drive this trend. In this study, the lowest-performing students are the ones most hurt by the online format.

○ Another study looked at performance gaps between online and face-to-face courses, specifically in terms of differences across types of student subgroups and academic subject areas.[2] Using a dataset containing nearly 500,000 courses taken by over 40,000 community and technical college students in Washington State, found that overall, the online format had a significantly negative relationship with both course persistence and standardized course grade, indicating that the typical student had more difficulty succeeding in online courses than in face-to-face courses. Those with the strongest declines in performance in online courses were males, younger students, Black students, and students with lower grade point averages.

   ■ Online performance gaps were also wider in some academic subject areas than others. After controlling for individual and peer effects, the social sciences and the applied professions (e.g., business, law, and nursing) showed the strongest online performance gaps.

○ Most researchers agree that effective virtual learning requires more student initiative and effort than comparable face-to-face instruction. This may be why lower-performing students struggle to do well in them; if students lack self-regulation skills to monitor their progress and discipline themselves.

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[2]Xu, Di, Jaggars, Shanna, S. (2014). Performance Gaps Between Online and Face-to-Face Courses: Differences Across Types of Students and Academic Subject Areas. *Journal of Higher Education (Columbus)*, *85*(5), 633-659., DOI: 10.1080/00221546.2014.11777343.

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**B. *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*[3]**

- This 93-page report on online education for the Department of Education was conducted by SRI International, and found on average students in online learning conditions performed better than those receiving face-to-face instruction.
    - The report examined the comparative research on online versus traditional classroom teaching from 1996 to 2008. Some of it was in K-12 settings, but most of the comparative studies were done in colleges and adult continuing-education programs of various kinds, from medical training to the military.
    - Over the 12-year span, the report found 99 studies in which there were quantitative comparisons of online and classroom performance for the same courses. The analysis for the Department of Education found that, on average, students doing some or all of the course online would rank in the 59th percentile in tested performance, compared with the average classroom student scoring in the 50th percentile. That is a modest but statistically meaningful difference.
        - "The study's major significance lies in demonstrating that online learning today is not just better than nothing — it actually tends to be better than conventional instruction," said Barbara Means, the study's lead author, and an educational psychologist at SRI International.
        - This hardly means that we will be saying good-bye to classrooms but the report does suggest that online education could be set to expand sharply over the next few years, as evidence mounts of its value.
        - The real promise of online education, experts say, is providing learning experiences that are more tailored to individual students than is possible in classrooms. That enables more "learning by doing," which many students find more engaging and useful. Technology can be used to create learning communities among students in new ways.

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[3] U.S. Department of Education Office of Planning, Evaluation, and Policy Development Policy and Program Studies Service. (2009). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies.* Washington, D.C.

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C. **How Does Distance Education Compare With Classroom Instruction? A Meta-Analysis of the Empirical Literature Review of Educational Research[4]**
   ● *Purpose*
      ○ Overall, is interactive distance education as effective, in terms of student achievement, student attitudes, and retention rate, as its classroom-based counterparts? What conditions contribute to more effective distance education?
   ● *Methods*
      ○ In total, 510 independent findings from 157 studies, based on a total of 40,495 students (achievement outcomes), were included in the analysis.
   ● *Results*
      ○ A very small but significantly positive mean effect size for interactive distance education over traditional classroom instruction on student achievement (Hedges' g = +0.0551, k = 248)
      ○ Small positive effect on student attitude towards technology used (g = +0.1498, k =24).
      ○ No significant difference was found in student attitude towards the course (g = –0.0089, k = 66).
      ○ There was a small negative effect of retention rate (g = –0.1034, k = 73), and a small negative effect for student attitude towards subject matter (g = –0.1876, k = 11) and towards instructor (g = –0.1720, k =29)."
      ○ Conditions that contributed to more effective distance education include the use of synchronous communication and interactive distance learning technologies such as computer-mediated communication and two-way audio and two-way video.

D. **The Comparative Effectiveness of Web-based and Classroom Instruction: A Meta-analysis[5]**
   ● *Purpose*
      ○ Meta-analytic techniques were used to examine the effectiveness of Web-based instruction (WBI) relative to classroom instruction (CI) and to examine moderators of the comparative effectiveness of the two delivery media.

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[4] Bernard, Robert, M., Abrami, Philip, C., Lou, Yiping, Borokhovski, Evgueni, Wade, Anne, Wozney, Lori, Wallet, Andrew P., Fiset, Manon, Huang, & Binru. (2004). How Does Distance Education Compare With Classroom Instruction? A Meta-Analysis of the Empirical Literature. *Review of Educational Research, 74*(3), 379–439.
[5]Sitzmann, T., Kraiger, K., Stewart, D., & Wisher, R. (2006). The Comparative Effectiveness of Web-based and Classroom Instruction: A Meta-analysis. *Personnel Psychology, 59*. 623-664.

- *Method*
  - A total of 96 studies from 1996-2005 qualified to be included in a meta-analysis.
- *Results*
  - The overall results indicated WBI was 6% more effective than classroom instruction for teaching declarative knowledge, the two delivery methods were equally effective for teaching procedural knowledge, and trainees were equally satisfied with WBI and CI.
  - Finally, WBI was 19% more effective than CI for teaching declarative knowledge when Web-based trainees were provided with control, in long courses, and when trainees practiced the training material and received feedback during training*.*

## E. *Effectiveness of Online & Blended Learning: A Meta-analysis of the Empirical Literature*[6]

- *Purpose/Background*
  - This meta-analysis was designed to produce a statistical synthesis of studies contrasting learning outcomes for either fully online or blended learning conditions with those of face-to-face classroom instruction.
- *Methods*
  - The meta-analysis was conducted on 50 effects found in 45 studies contrasting a fully or partially online condition with a fully face-to-face instructional condition. Length of instruction varied across studies and exceeded one month in the majority of them.
  - The meta-analysis corpus consisted of (1) experimental studies using random assignment and (2) quasi-experiments with statistical control for pre-existing group differences. The effect size was calculated or estimated for each contrast, and average effect sizes were computed for fully online learning and for blended learning. A coding scheme was applied to classify each study in terms of a set of conditions, practices, and methodological variables.
- *Results*
  - The meta-analysis found that the advantage over face-to-face classes was significant in those studies contrasting blended learning with traditional face-to-face instruction but not in those studies contrasting purely online with face-to-face conditions.

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[6] Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record, 115*(3), 1–47.

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- Studies using blended learning also tended to involve additional learning time, instructional resources, and course elements that encourage interactions among learners. This confounding leaves open the possibility that one or all of these other practice variables contributed to the particularly positive outcomes for blended learning.
- Further research and development of different blended learning models are warranted.
    - Experimental research testing design principles for blending online and face-to-face instruction for different kinds of learners is needed.

### F. Survey Feedback from Virtual and Classroom Training Participants[7]

- *Purpose*
    - When designed carefully and consciously, virtual training can provide the same results as traditional classroom training. *VitalSmarts* surveyed graduates of both the virtual and classroom courses and found equal results when it comes to participant engagement, skill retention and mastery, behavior change, and organizational results.
- *Highlights*
    - 86 percent of virtual classroom participants rated the experience "just as engaging" or "more engaging than" traditional classroom training.
    - 100 percent of the participants were highly satisfied with their training experience.
    - Participants averaged a score of 90 percent on a test that measures mastery of skills, 1 percentage point higher than cognitive scores in the traditional classroom.
    - There was no difference between the virtual and traditional classroom participants with regard to behavior change. For both groups, it was immediate.
    - The only area where classroom training rated higher was on long-term maintenance of these behavior changes.
        - *VitalSmarts* surveyed participants after several months and asked them how confident they were in using the skills at home and at work. Both groups reported they were "very confident" in using the skills, though participants who took the training in a traditional classroom reported slightly more confidence by 2 percentage points.

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[7]Maxfield, D. (2016). Virtual vs. Classroom Training. *Training Magazine*.

- ○ As the results indicate, the latest virtual training technologies allow for a high-quality training experience that delivers results. And with comparable results, virtual training can offer more in terms of scheduling flexibility and ease of training.


### G. *Student Perceptions and Instructional Evaluations: A Multivariate Analysis of Online and Face-to-Face Classroom Settings*[8]

- *Purpose*
  - ○ This study examined students' evaluations of faculty performance in traditional and online classes. The study design builds upon prior research that addressed socially relevant factors such as classroom environments, students' learning goals, expected, and received grades, and more importantly, students' ratings of instructors' performance.
    - ■ The quality and effectiveness of instruction in online classes versus face-to-face settings continue to foster arguments over the appropriate pedagogy in a qualitatively different setting, i.e., synchronous versus asynchronous environment (Driscoll et al. 2012; Abdous and Yoshimurra 2010; Angiello 2010; Milliron 2010; Benigno & Trentin, 2000).
- *Methods*
  - ○ The sample consisted of data from a population of humanities and social sciences faculty from a medium-sized southwest undergraduate university who taught both online and traditional classes during the semester periods Fall 2010 to Spring 2012.
- *Results*
  - ○ In a traditional setting, the evaluation factors (develops a rapport with students, stimulates students, challenges student learning, provides timely feedback, and teaches fundamentals), and the external factors—(course level taught and gender)—were found to significantly contribute to faculty summary scores.
  - ○ In an online class, students consistently rank female instructors better.
  - ○ However, the evaluation criteria—develops student rapport, stimulates students, provides timely feedback, and teaches fundamentals (though not 'challenges and involves students in their learning')—in an online class mirrored the same effects observed in the traditional classroom evaluations.
  - ○ The finding that "teaches fundamentals" received the largest

[8]Brocato, B. R., Bonanno, Alessandro, & Ulbig, S. (2015). Student perceptions and instructional evaluations: A multivariate analysis of online and face-to-face classroom settings. *Education and Information Technologies, 20*(1), 37–55.

standardized beta-coefficient in both classrooms further confirms earlier research that university students perceive course mastery as a major indicator of instructor performance regardless of gender or rank.
- ○ However, the results indicate that students' perceptions are different when attending a traditional versus an online classroom setting. This infers that synchronous and asynchronous settings require different teaching styles and different evaluation criteria.

## H. *Evaluating Webinar-based Training: A Mixed Methods Study of Trainee Reactions Toward Digital Web Conferencing*[9]

- ● *Purpose*
  - ○ The purpose of the study was to explore and evaluate the reactions of training participants toward digital webinar-based training programs in order to contribute to the growing body of evidence on digital webinar-based training.
    - ■ In addition to estimating satisfaction levels, particular interest was in analyzing how the evaluated reactions could be used to generate empirical, evidence-based recommendations for the delivery of webinars in training, adult education, and human resource development (Johnson et al., 2011; Wang & Hsu, 2008; Zomenou et al., 2015).
    - ■ Because the previous literature underemphasized the webinar process and qualitative learner experiences, using a sequential mixed methods research design, this study aimed to explore the reactions of 419 trainees toward 48 webinars in the four content areas supply chain management, industrial management, early childhood education, and mathematics.
- ● *Background*
  - ○ Webinars are digital tools to deliver training and education through synchronous audiovisual communication among remotely located training instructors and participants. A webinar is a special case of web conferencing that serves the educational function of learning and teaching.
  - ○ Trainees and trainers both report that they are satisfied with or enjoyed participating in webinar-based training (Cornelius & Gordon, 2013; Kear, et al., 2012; Wang & Hsu, 2008).

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[9] Gegenfurtner, Andreas, Zitt, Alexander, Ebner, & Christian. (2020). Evaluating webinar-based training: A mixed methods study of trainee reactions toward digital web conferencing. *International Journal of Training and Development, 24*(1), 5-21.

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- Harned and Colleagues (2014) evaluated webinars in the context of mental health training. *Their findings suggested that participants were most satisfied with consultations from the facilitator and being able to ask questions.*
- Kanter et al. (2013) used webinars to simulate and train therapy situations. *Their participants reported that they were most satisfied with the synchronous interaction, feedback and support from the facilitators and peer trainees.*
- A meta-analysis reviewing the effectiveness of webinars for training concluded that webinars were slightly more effective in promoting student achievement than were traditional face-to-face seminars and asynchronous training in learning management systems (Gegenfurtner and Ebner, 2019).
  - Still, although highly useful, aspects such as the instructional design during the webinar, the training content, or how the webinar can be implemented tend to be deemphasized.
  - Qualitative studies on webinar-based training exist (Amhag, 2015; Cornelius, 2014; Johnson et al., 2011; Wang & Hsu, 2008); yet, these qualitative evaluations tend to have small sample sizes, which limit the applicability and generalizability of their findings to other webinar-based training programs.
- *Methods*
  - The research question was *What are the reactions of training participants toward digital webinar-based training?*
  - To answer this research question the present study adopted a mixed methods research design (Creswell & Creswell, 2018).
    - The quantitative part of the study employed a multi-item online questionnaire to measure satisfaction and reactions toward the webinar trainer; survey responses were analyzed to estimate mean differences across webinars.
    - The qualitative part of the study employed narrative interviews with 23 trainees; interview transcripts were analyzed with qualitative content analysis to identify how the instructional design, webinar content, and implementation can be improved for future web conferences.
- *Results*
  - Trainees preferred greater levels of learner-teacher interaction, spent less time on discussing task solutions collaboratively and digital webinar recordings as a follow-up possibility at home or in the

workplace. Trainees also liked the fact that webinars afforded the possibility to deepen the content, to prepare for upcoming exams, and to have virtual consultation hours with the facilitator.
- Furthermore, trainees preferred webinars no longer than 90 minutes and webinars on weekdays after work rather than during weekends.
- Optimal internet/broadband connections were perceived as a requirement across web conferencing and virtual classroom programs for effective digital education.
- To summarize, participants wished for a more learner-centered instructional design with higher levels of trainee-trainer interaction; they asked for less time spent on discussing task solutions collaboratively, and they enjoyed and appreciated the digital webinar recordings as a follow-up possibility.

I. ***A Comparison of Student Performance and Satisfaction in an Online versus a Face-to-face Introductory Sociology Course[10]***
- This study uses a quasi-experimental design to assess differences in student performance and satisfaction across online and face-to-face (F2F) classroom settings.
- Data were collected from 368 students enrolled in three online and three F2F sections of an introductory-level sociology course.
  - The instructor, course materials, and assessments were consistent between the two delivery formats.
- The investigators compare student satisfaction and student performance on midterm exams and an integrating data analysis assignment. Ordinary least squares regression is used to evaluate the effect of the different course settings, independent of a number of demographic and control variables.
- Results indicate that differences in student performance between the two settings may be accounted for by the presence of a selection effect and that student satisfaction does not significantly differ across the two settings.
- These findings are interpreted to mean that when online courses are designed using pedagogically sound practices, they may provide equally effective learning environments.

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[10]Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L., & Thompson, G. (2012). Can online courses deliver in-class results? A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course. *Teaching Sociology, 40*(4), 312-331.

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### J. *Evaluation of Knowledge Transfer in an Immersive Virtual Learning Environment for the Transportation Community[11]*

- *Purpose*
    - Immersive Virtual Learning Environments (IVLEs) are extensively used in training, but few rigorous scientific investigations regarding the transfer of learning have been conducted.
    - The purpose of this research study was to determine if an IVLE increased the learning transfer of the knowledge obtained in a work zone safety Basic Flagging Procedures course.
    - Research has shown that immersive virtual learning environments are advantageous for training psychomotor activities and spatial activities, but it is unclear whether these environments are beneficial for memorizing a procedure.
    - This research will expand the current empirical knowledge of a virtual learning environment in education, specifically that which deals with knowledge transfer in an IVLE as it enhances and supplements traditional learning through blended delivery methodology.
- *Background*
    - Measurement of learning transfer through evaluative methods is key for determining the likelihood of equivalent performance post-training intervention.
    - The current body of literature provided a theoretical foundation in reference to critical benefits that can be garnered through the use of IVLE technology in the classroom
        - IVLEs go beyond traditional visual learning by presenting images that combine a new form of visual learning and virtual experiential learning in a way that is more congruent with an individual's visual images stored in memory, thus improving knowledge transfer and retention.
        - The visual cues that the learner experiences in the virtual world are so similar to the visual cues in the real world that recall of virtual world lessons stored in memory is triggered by the same cues in the real world.
        - Additionally, the student can experiment, make mistakes, and repeat the activity as often as necessary, achieving a virtual-experiential understanding of the concept that can only be

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[11] Coco, M.L., Cavin, G. (2014). Evaluation of Knowledge Transfer in an Immersive Virtual Learning Environment for the Transportation Community. Louisiana Transportation Research Center. Retrieved from https://www.ltrc.lsu.edu/pdf/2014/FR_502.pdf

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duplicated in real-world experiential learning, which is often not practical.
- Such immersive engagement in the learning activity allows the learners to move beyond the memorization of the presented concepts and into the application and synthesis of the material.
- More important than the IVLE technology is the ability of IVLEs to provide higher critical thinking to learners. IVLEs are often implemented through the use of game-based technology, which is argued to hold the promise for fostering critical thinking skills and other 21st century skills.
- The role of a highway flagman is one that involves high-order problem solving and decision-making skills due to variables, such as weather conditions, traffic complexity, multifaceted geographic settings, and multiple lane intersections, that impact a flagman's final decision regarding construction and/or maintenance work zone design and implementation.
  - For this reason, it is critical for flaggers to receive highly transferable training so they can perform to the best of their ability.
- *Results*
  - Based on the findings of this study, the researcher concluded that participants who took part in the experimental group displayed progressive improvement in the application of the flagging procedures while in the IVLE, as denoted in the IVLE telemetry data.
  - The researcher also concluded that participants who participated in the experimental class were more engaged in the learning process than they had been in traditional style classes, as denoted in the qualitative interviews. Such engagement in the classroom is critical not only for learning transfer but for application of the principles when returning to the worksite
  - From the findings in this study, the researcher concluded that despite the lack of literature relating to the research of the marginalized population within an IVLE, this population can be and was successful through this type of educational intervention as demonstrated by the results of the distance integrals in the telemetry data.
  - Use of IVLE technology may aid in decreasing the number of work zone fatalities that occur each year by allowing active experimentation in a highway construction or maintenance work zone to occur in a safe and supportive learning environment. Active experimentation

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within an IVLE will allow learners the opportunity to apply work zone regulations and procedures in a realistic, although simulated, environment. Unlike the real world, a mistake in this virtual environment will not result in the loss of life.

### K. *Comparative Analysis of Student Performance in an Online vs. Face-to-Face Environmental Science Course From 2009 to 2016*[12]

- *Background*
    - The limitations of the study centered around the nature of the sample group, student skills/abilities, and student familiarity with online instruction.
        - First, because this was a convenience, non-probability sample, the independent variables were not adjusted for real-world accuracy.
        - Second, student intelligence and skill level were not taken into consideration when separating out comparison groups.
        - Finally, there may have been ease of familiarity issues between the two sets of learners. Experienced traditional classroom students now taking Web-based courses may be daunted by the technical aspect of the modality. They may not have had the necessary preparation or experience to efficiently e-learn, thus leading to lowered scores (Helms, 2014).
- *Methods*
    - The scores of 548 students, 401 traditional students, and 147 online students, in an environmental science class were used to determine which instructional modality generated better student performance.
    - Student performance was operationalized by final course grades. The final course grade was derived from tests, homework, class participation, and research project scores. The four aforementioned assessments were valid and relevant; they were useful in gauging student ability and generating objective performance measurements.

- *Results*
    - No significant difference in student performance between online and face-to-face (F2F) learners overall, with respect to gender, or with respect to class rank were found.

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[12]Paul, J. & Jefferson, F. (2019) A Comparative Analysis of Student Performance in an Online vs. Face-to-Face Environmental Science Course From 2009 to 2016. Front. *Computer Science, 1*:7.

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- **L. *Characteristics of Online Learning Associated with Improved Outcomes in Health Professions Learners: A Systematic Review and Meta-analysis*[13]**
  - *Purpose*
    - The authors sought to answer the following question: "What characteristics of Internet-based learning (IBL) interventions, as compared with other computer-based interventions, are associated with improved outcomes in health professions learners?"
  - *Methods*
    - Authors included studies published in any language that investigated the use of the Internet, in comparison with another computer-based intervention, to teach health professions learners at any stage in training or practice, using the Kirkpatrick outcomes of (1) satisfaction, (2) knowledge or attitudes, (3) skills (in a test setting), and (4) behaviors (in practice) or effects on patients.
  - *Results*
    - Pooled effect sizes for satisfaction and/or learning outcomes (knowledge, skills, or behaviors and patient effects) were positive but small for associations with nearly all of the themes identified.
      - However, the pooled estimates for satisfaction differed significantly from zero only for associations with interactivity, online discussion, and use of audio for both tutorials and online discussion, whereas estimates for learning differed significantly only for associations with interactivity, practice exercises, feedback, and repetition.
      - Inconsistency (heterogeneity) between studies was large (≥89%) for all but online discussion and satisfaction. These inconsistencies allow authors to draw only weak inferences.
    - The synthesized evidence suggests that interactivity, practice exercises, repetition, and feedback improve learning outcomes and that interactivity, online discussion, and audio improve satisfaction in internet-based learning for health professionals. Although educators should consider incorporating these features when designing internet-based learning, the strength of these recommendations is limited.

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[13] L Cook, D. A., Levinson, A.J., Garside, S., Dupras, D.M., Erwin, P.J., Montori, V.M. (2010, May). Instructional design variations in internet-based learning for health professions education: a systematic review and meta-analysis. *Acad Med. 85*(5):909-22.

### M. What Makes the Difference? A Practical Analysis of Research on the Effectiveness of Distance Education[14]

- *Purpose*
  - The purpose of this study was to identify factors that affect the effectiveness of distance education.
- *Methods*
  - A total of 8,840 potentially relevant articles were rigorously filtered down to 51 through a selection process that specified specific criteria the researchers were looking for. Afterward, the analytical framework worked to mitigate the effects of confounding variables and possible errors before statistical analysis was completed.
  - Authors used Schwab's four commonplaces of education to guide the identification of instructional features that can potentially affect the effectiveness of distance education programs: the teacher, the student, the curriculum, and the milieux. In each of the four common places are a number of potential factors that contribute to the outcomes of learning.
  - When the information of mean and standard deviation for both control and experimental groups were available, the effect size was computed by subtracting the control group mean (face-to-face education) from the experimental group (distance education) mean and dividing the difference by their pooled standard. When the information of means and standard deviations was not available and only t-test values were reported, the effect size was computed based on t-value and the degree of freedom. When only the F values and sample sizes were reported, and there were only two groups, the effect size was computed based on the F value and sample sizes.
- *Results*
  - Aggregated data of all available studies show that, as a whole, there is no significant difference in outcomes between distance education and face-to-face education confirming the "no significant difference" claim of previous researchers.
  - Interaction is key to effective distance education; live human instructors are needed in distance education; the right mixture of human and technology seems most beneficial; distance education may be more appropriate for certain content; some learners may be

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[14]Zhao, Yong & Lei, Jing & Yan, Bo & Lai, Chun & Tan, Sophia. (2005). What Makes the Difference? A Practical Analysis of Research on the Effectiveness of Distance Education. *Teachers College Record - TEACH COLL REC*. 107. 1836-1884. 10.1111/j.1467-9620.2005.00544.x.

more able to take advantage of distance education, and distance education seems to get better over time.
- ○ Distance education is in essence still education. Results from this study further support this argument. The factors found to have an impact on the effectiveness of distance education are also factors that would affect the effectiveness of face-to-face education.

N. *Blended Learning and Sense of Community: A Comparative Analysis with Traditional and Fully Online Graduate Courses*[15]
- *Purpose*
    - ○ The purpose of this study was to examine how a sense of community differed across fully traditional, blended, and fully online courses.
- *Method*
    - ○ A total of 68 graduate students were enrolled in 3 graduate-level classes and the Classroom Community Scale (CCS) was used to measure connectedness and learning plus anecdotal evidence was collected.
- *Results*
    - ○ Evidence provided suggest that blended courses produce a stronger sense of community among students than either traditional or fully online courses.
    - ○ Chi-square contingency table analysis provided evidence that there were no significant differences in the composition of the three courses by gender, age, or ethnicity.
    - ○ The ability to generalize findings beyond the present study is limited because only three courses at the same university were sampled and the learner characteristics, course content, course design, and pedagogy used by the professors in the present study may not be representative of other professors and other settings. Additionally, the researchers exercised no experimental control over the courses examined in the present study and cause-and-effect relationships were not confirmed.
    - ○ Often cited characteristics of successful online students include interest in the material taught, self-motivation, independent and self-directed learner, critical thinker, family support, positive and timely feedback, accepts responsibility for own learning, organized, and practical knowledge in the use of computers.

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[15]Rovai, A. P., & Jordan, H. (2004). Blended Learning and Sense of Community: A Comparative Analysis with Traditional and Fully Online Graduate Courses. *The International Review of Research in Open and Distributed Learning*, 5(2).

- ○ After adjusting for course pretest differences, the combined dependent variable of connectedness and learning differed significantly among the three courses. The effect size, as measured by partial η2, was medium.
    - ■ The blended course possessed a significantly higher adjusted mean connectedness score than either the traditional or online courses with a large effect size. The blended course also possessed a significantly higher adjusted mean learning score than the online course, but with a medium effect size.

### O. *Online vs. Face-to-Face Course Evaluations: Considerations for Administrators and Faculty*[16]
- *Purpose*
    - ○ The purpose of this study was to determine whether students evaluate courses differently, and perhaps more critically, when delivered online vs. face-to-face (F2F). It also sought to examine antecedents contributing to the ratings but does not attempt to identify any causal order of factors that cause students to rate online and F2F courses differently.
- *Method*
    - ○ This study employed a quantitative, non-experimental research design, which assessed approximately 3,500 student course evaluations involving both online and face-to-face MBA classes, at a mid-sized private mid-western university, where the online delivery was facilitated in the Blackboard LMS, via asynchronous mode. Twenty-one course/instructor (anonymity preserved) combinations of online and face-to-face student course evaluations were obtained over a four-year period to assess student satisfaction.
- *Results*
    - ○ Generally, it was found that students do evaluate courses differently in online versus face-to-face (F2F) courses. The ratings of the online courses were lower than the ratings of the F2F courses, for the same instructor, in multiple instances. Regarding the assessment of variables contributing to course ratings, only the Participation variable stood out as statistically significant to the online courses.
    - ○ Given the results of this study, here are some considerations for administrators and faculty.

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[16] Marzano, M., P. (2016). Online vs. Face-to-Face Course Evaluations: Considerations for Administrators and Faculty. *Online Journal of Distance Learning Administration, Volume XIX*(4).

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- The results indicate that online courses may have a lower course rating.  This could have administrative ramifications for policies regarding student evaluation of courses for online courses and instructors.  Administrators using the same course evaluation scale may need to adjust their faculty performance assessment depending upon delivery mode or there may need to be different instruments measuring the courses, for the two modalities.

- Administrators may need to expend extra effort in training and coaching faculty who are deployed to teaching online courses.  Through their course ratings, students have evaluated online courses lower, regarding overall satisfaction. Faculty need to be coached about factors that contribute to course rating, by modality.

- Faculty need to be aware of the potential for lower course ratings due to modality.  Knowing the potential for lower ratings would permit a faculty member to be prepared for lower scores.  It would also permit the faculty member to be more informed about which modality they may prefer.  Additionally, it would allow the faculty member to hone specific skills indicated to be important, relative to modality.

- Course Designers need to develop activities that will bolster student participation, regarding course design and facilitation for online courses.  Faculty need to be cognizant of the online student's expectations of faculty/student participation and feedback. Faculty have to make a conscious effort to 'be in' the online classroom in order to meet student expectations.

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## II. Recommendations for Making Virtual Better than In-Person Learning

A. *How to Make Virtual Learning Better, Not Worse, Than In-Person*[17]

- NeuroLeadership Institute's (NLI) research shows that virtual learning, when done right, can be dramatically more effective than in-person workshops. In fact, an analysis of the likelihood of people taking action on a learning program showed that a smart virtual learning program was around six times more likely to get people to take action than the usual way learning is delivered in person. Not 6% better, or 60% better, but 600% better. Here's why and how:
  - *The Science of Learning:* To understand why virtual learning programs fail and how to make them better it is important to define the purpose of learning in the first place. In the organizational context, the purpose of learning is to change behavior. For change to occur, new learning must be remembered. Now, much of the learning that organizations invest in involves human skills. Things like how to run meetings well, how to give feedback, how to deal with difficult conversations. In these situations, people are under pressure, and if they are going to follow something other than their automatic way of interacting, they will need to recall what they learned very quickly and easily—literally, in an instant, and likely while feeling anxious. For example, if the goal is to teach a manager how to run meetings more inclusively, if that manager is then able to remember what they learned only if they pause to think deeply and consult their notes from class, the program has failed. For learning to be effective, the learner must be able to easily recall it even when they're tired, behind on a deadline, or anxious about getting things wrong and looking foolish in front of their team.
    - NLIs research over many years, initially published in 2010 and updated many times since shows that easy recall under pressure is possible only when four conditions are met during an encoding task: Attention, Generation, Emotion, and Spacing—a framework defined in the NeuroLeadership Institute's AGES Model. Research has found that the key to effective learning is activating the hippocampus, a brain region

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[17] Dixit, J, & Rock, D. (July 2020). *How to Make Virtual Learning Better, Not Worse, Than In-Person.* Neuroleadership Institute. Retrieved from https://neuroleadership.com/your-brain-at-work/how-to-make-virtual-learning-better

that helps consolidate new information into memory. For ideal hippocampal activation to occur, all four AGES components must be optimized, and not just at low to moderate levels, but at very high levels. If any of the below conditions are not high during an encoding task, then the likelihood of easy recall under pressure drops significantly.\

- *Attention:* For learning to occur, participants must pay close attention to what they are learning. High attention means focusing very closely on one thing, with no other distractions.
- *Generation:* Since we form memories by making associations, learning works best when participants generate their own connections to the material, linking new ideas to their own existing knowledge.
- *Emotion:* For memories to stick well there need to be strong emotions during encoding, which activates the hippocampus.
- *Spacing:* Learning is most effective when learning sessions are spaced out over time, especially when the gap between sessions includes one or more nights of sleep.

■ When deployed correctly, virtual learning is capable of activating high levels of attention, generation, emotion, and spacing. Even higher levels than you can in a single half-day or daylong workshop.

○ Instead, unfortunately, many organizations have taken flawed practices from in-person programs and simply migrated them online, making them even worse in terms of attention, generation, and emotion—often at great cost.

○ *Most Common Mistakes with Virtual Learning and What to do Instead*:

■ *Mistake #1: Running online learning sessions of 2 to 4 hours in length.* Anyone who has ever had to sit through a long university lecture knows that the [brain loses focus quickly](). When learning sessions are long, learning is low, since participants are unable to pay attention for hours on end at the level needed for strong memory encoding to occur.

● The solution: For virtual learning to be effective, sessions should be 50 or 55 minutes long. But that doesn't mean the learning itself is shallow. When

learning is designed well, learners can achieve intense [insights](#) in short periods of time.

- *Mistake #2: Cramming learning into a single session or week.* Most learning programs attempt to cram as much learning as possible into a short period. Back when most learning occurred in-person, that approach made more sense, given the costs of reserving physical space and the time required for facilitators and participants to commute to the location. But virtual learning makes it easy to space sessions out over time without incurring extra costs. Since no commuting is required, it is easy to break learning up over multiple sessions on different days.
  - The solution: Organizations should make virtual learning sessions shorter and allow more time in between, stretching learning out over three weeks or more. The result is powerful learning that is far more effective than a single session could ever be, because of the spacing effect. It also allows you to make learning more social, a critical factor for success, as we go into next.
- *Mistake #3: Failing to make learning social.* Most learning programs are content to let participants walk out the door and not give material another thought until they return for the next session if there even is a next session. This is a squandered opportunity to leverage the power of social learning.
  - The solution: To maximize recall, learning programs should engage participants' [social networks](#) every week, encouraging them to share what they have learned with teammates, friends, and family. By connecting learning material to social interactions, participants link new ideas to the brain's social memory network, resulting in better recall later on. Moreover, the effect of thinking other people might be watching you creates positive social pressure. When learning is social, learners encode more richly, recall more easily, and act more often.
- *Mistake #4: Designing for Net Promoter Score instead of behavior change.* Most learning programs are designed to be fun and popular. But since effective learning is effortful, such programs are often ineffective. In fact, learning that really sticks tends to involve [making people feel mildly uncomfortable](#), given this means participants likely experienced strong emotions.

- The solution: Rather than trying to create content people will like, focus instead on activating habits. That means not just teaching skills, but also gauging a program's effectiveness by measuring change—as NLI does with the *Behavior Change Percentage* metric.
  - *Leverage the moment:* This is a unique moment. Even as the coronavirus pandemic inflicts tremendous pain and hardship in our society, it is also unleashing newfound energy and motivation in organizations.
    - With so many processes in flux, employees are more willing than ever to do things differently. However, the momentum of this crisis will not last forever.
    - Leaders should seize the opportunity to redefine their approach to virtual learning before the energy dissipates. How should we rethink learning and build a better normal? Like many things today, it can pay to follow the science.

## B. *Best Practices of Virtual Training Design[18]*
- *Summary*
  - There are a lot of bells and whistles that accompany the synchronous virtual classroom. Used incorrectly, these tools actually can deter rather than assist in skill transfer. Not all virtual training is created equal. Through rigorous beta testing, *VitalSmarts* found a right and a wrong way to deliver virtual learning. This article includes best practices they have discovered about designing virtual training to deliver the kinds of results found in the traditional classroom experience.

- *Best Practices*
  - **Quickly change learning modalities.** In a traditional classroom, it is typical to change modalities every 15 minutes. However, attention spans are much shorter for virtual learners, so it is best to change learning modalities every three to five minutes to keep people's attention and ensure full engagement. These quick modality changes ensure a lively, interactive experience, while also making it nearly impossible for the learner to multitask during the course. Feedback shows this type of demanding engagement eliminates e-mail

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[18]Maxfield, D. (2016). Virtual vs. Classroom Training. *Training Magazine*.

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distraction and Web surfing during the training—a notorious detractor of skills retention and mastery.

- **Do not skimp on interaction and practice time.** Deliberate practice of skills and concepts is vital to any successful classroom training and should not be overlooked in the virtual world. And yet, many virtual programs are light on skill rehearsal. Instead, create as much interaction, practice, rehearsal, and feedback as a traditional on-site classroom course. Technology allows for breakout sessions with two or three virtual participants. In the case of interpersonal skills, they can use this time to practice word choice, tone of voice, and other key conversational elements. The facilitator can join these breakout groups to provide instant coaching and feedback to the team.
- **Use virtual tools to increase engagement.** Virtual technology easily allows for polling and quizzing. Not only do these tools drive engagement, but they also test learning and skill retention. Virtual training is also an excellent medium for video-based learning to build skills, demonstrate mistakes, and model correct behaviors.
- **Design for spaced learning.** Sitting in front of a computer screen for hours is much more taxing than sitting in a classroom surrounded by people and interactive discussion. Therefore, account for potential fatigue by reducing the time people spend in front of the screen. The optimal amount to be no longer than two-hour sessions spaced over multiple days. This delivery model also provides more flexibility in scheduling while preventing learner fatigue.

C. *The Effect of Games and Simulations on Higher Education: A Systematic Literature Review[19]*
- *Purpose*
  - *The* main objective is to study the impact of games and simulations with regard to achieving specific learning objectives.
- *Background/Methods*
  - *To* establish a context, the researchers, initially, examined the relevant literature on the effectiveness of all types of games and simulations in learning outcomes. They systematically reviewed the literature relevant to games and simulation pedagogy in higher education.

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[19] Vlachopoulos, Dimitrios, & Makri, Agoritsa. (2017). The effect of games and simulations on higher education: a systematic literature review. *International Journal of Educational Technology in Higher Education*, 14(1), 1–33.

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○ In recent years, the interest in examining game use in higher education has increased. This includes educational games (Çankaya & Karamete, 2009), digital game-based learning (DGBL) (Yang, 2012), and applied games (van Roessel & van Mastrigt-Ide, 2011). In addition, scholars, sometimes, include interactive exercises (Mueller, 2003), video games (Biddiss & Irwin, 2010), or even expand to next-generation video games (Bausch, 2008), in the category of games.
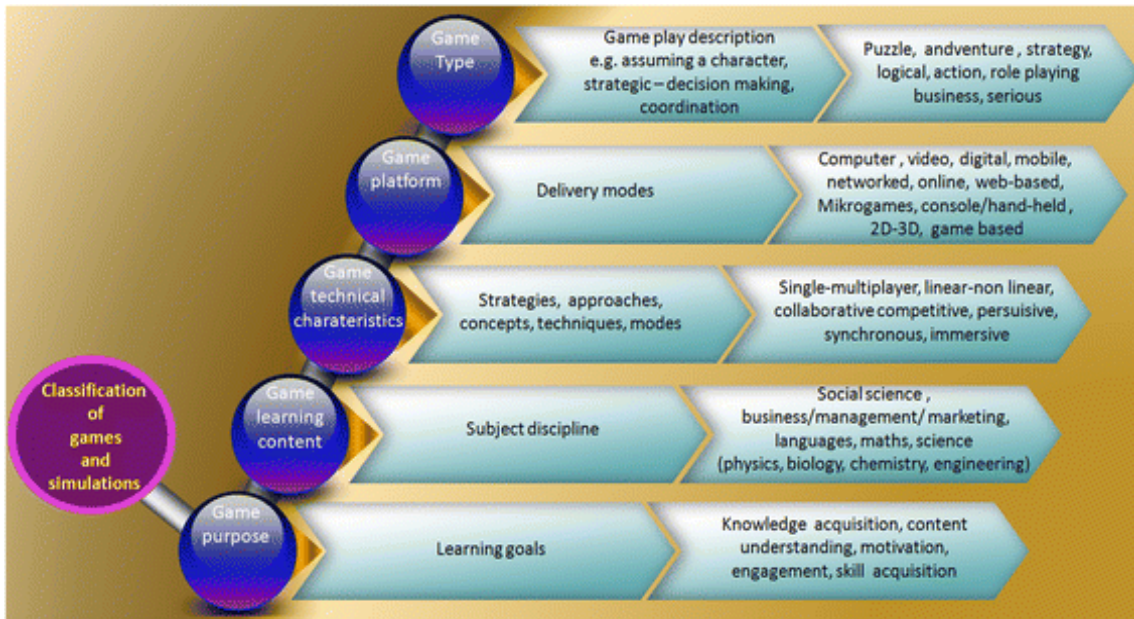


○ Two researchers collaborated to apply a qualitative method, coding, and synthesizing the results using multiple criteria.

● *Results*
  ○ Results indicate that games and/or simulations have a positive impact on learning goals.
  ○ The researchers identify three learning outcomes when integrating games into the learning process: cognitive, behavioral, and affective.
  ○ Today's demand for student-centered teaching methods to develop highly qualified learners, capable of learning in an active and collaborative environment, calls for the deployment of game-based activities and simulations that will enable them to face the challenges of the dawning era.
  ○ As a final step, the authors consolidate evidence for the benefit of academics and practitioners in higher education interested in the efficient use of games and simulations for pedagogical purposes. Such evidence also provides potential options and pathways for future research.

## III.   Measuring Transfer of Learning (TOL) in Virtual Training

A. ***Factors That Support Training Transfer: A Brief Synopsis of the Transfer Research[20]***
- *Purpose/Method*
  - While transfer researchers have done a great deal of work in uncovering how transfer works, the research base is not as solid as it should be. For example, much of the transfer research uses learners' subjective estimates of transfer— rather than actual transfer—as the dependent measure.
  - The goal of this research review was to distill validated transfer factors—learning design and learning support elements that increase the likelihood that learning will transfer—and make these insights practical
    - In targeting this goal, this review aligns with transfer researchers' recent admonition to ensure the scientific research on learning transfer gets packaged in a format that is usable by those who design and develop learning (Baldwin, et al., 2017).
- *Results*
  - Unfortunately, after reviewing the scientific articles referenced in this report as well as others not cited here, the author's conclusion is that many of the most common transfer approaches have not yet been researched with sufficient rigor or intensity to enable us to have full certainty about how to engineer transfer success.
  - Recommendations on how we can have a stronger research base are referenced
  - Despite the limitations of the research, this review uncovered many testable hypotheses about the factors that may support transfer. Factors are presented here in two categories—those with strong support in the research, and those the research identifies as having possible benefits.
    - There are 17 research-supported recommended transfer factors and an additional six possible transfer factors. Here is a subset of the supported transfer factors:
      - Transfer occurs most potently to the extent that our learning designs strengthen knowledge and skills.

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[20] Thalheimer, W. (2020, January 6). *Factors That Support Training Transfer: A Brief Synopsis of the Transfer Research*. Work-Learning Research Inc. https://www.worklearning.com/2020/01/06/major-research-review-on-learning-transfer/

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- Far transfer hardly ever happens. Near transfer—transfer to contexts similar to those practiced during training or other learning efforts—can happen.
- Learners who set goals are more likely to transfer.
- Learners who also utilize triggered action planning will be even more likely to transfer, compared to those who only set goals alone.
- Learners with supervisors who encourage, support, and monitor learning transfer are more likely to successfully transfer.
- The longer the time between training and transfer, the less likely that training-generated knowledge creates benefits for transfer.
- The more success learners have in their first attempts to transfer what they have learned, the more likely they are to persevere in more transfer-supporting behaviors.

  The remaining recommendations can be viewed in the report: *Transfer of Training Quick Research Review* (2020).

B. ***Centers for Disease Control and Prevention (CDC): Recommendations for Training Effectiveness[21]***
- In 2019, the CDC released multiple resources to support the design of training course evaluations that can give better predictions about participant learning outcomes. Their constructs exhibit strong, consistent relationships with learning and the transfer of learning, are not difficult to measure and can be measured in different training settings (in-person and web-based settings) with adult professional learners.
  - *Before & After Training*
    - The best way to evaluate any change in learning is through an assessment before and after the training. Conduct a pretest before and a posttest after your training and then compare the results.
      - Considerations:
        - The test can include a demonstration to assess skills in addition to knowledge if needed.

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[21] Centers for Disease Control and Prevention. (2019, December 20). *Training Effectiveness.* Centers for Disease Control and Prevention. Content source: Deputy Director for Public Health Science and Surveillance, Center for Surveillance, Epidemiology, and Laboratory Services, Division of Scientific Education and Professional Development.;  Centers for Disease Control and Prevention. (2019). *Recommended Training Effectiveness Questions for Postcourse Evaluations User Guide.* Atlanta, GA: CDC.

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- ○ Using only a posttest, without a pretest, can provide an assessment of skill or knowledge proficiency. This allows you to know if learners achieved a certain level of knowledge or skill by the end of the training, but you will not know if there was a change in learning. Learners might have already had the knowledge or skill at the start of the training.
- ○ If you are unable to assess learning through a pretest and posttest, consider using a retrospective pre/post assessment that asks learners to self-assess their knowledge before and after the course as part of a post-course evaluation.
- ○ *During Training*
    - ■ Build knowledge or skill assessment into the training, like knowledge checks, quizzes, or observations. This can provide evaluation data and reinforce learning at the same time.
        - ● Considerations:
            - ○ In eLearning, use knowledge checks throughout the course to help reinforce learning. Those same knowledge checks give you data on how learners are progressing during the course.
            - ○ For in-person training, you might ask your learners questions to assess their comprehension or use an activity to gauge how they apply what they are learning. This provides real-time information for the instructor to reinforce content or adapt as needed.
- ○ *Immediately After Training*
    - ■ In many situations, you might only be able to gather information from your learners immediately after the training ends. You can design your post-course evaluation to assess learning and predict learning transfer immediately after the course ends, while learners are available to respond.
        - ● Considerations:
            - ○ Post-course evaluations traditionally focus on learner satisfaction, but the research shows learner satisfaction does not determine a training's effectiveness.

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- ○ Post-course evaluations cannot objectively assess learning or learning transfer, but focusing on the areas with the strongest, most consistent relationships with learning and learning transfer can provide you with meaningful data about training effectiveness.
        - ○ Refer to Section 3 (P. 7-10) of *Recommended Training Effectiveness Questions for Postcourse Evaluations: User Guide*[22] (2019) for recommended questions to use immediately after training ends.
    - ○ *Delayed Evaluation or Follow-up*
        - ■ Delayed evaluation, also called follow-up evaluation, is the best way to assess learning transfer. This helps training developers understand how much information learners retained, and if they have applied what they learned on the job. You can follow-up with learners to assess learning transfer after they have had time to go back to their workplace and apply what they have learned.
            - ● Considerations:
                - ○ For some training, it might also be appropriate to follow-up with learners' supervisors.
                - ○ The timing of your delayed evaluation should be based on your program resources, the specific topic of the training, and learners' capacity to apply what they learned in the workplace.
                - ○ Refer to Section 3 (P. 10-11) of *Recommended Training Effectiveness Questions for Postcourse Evaluations: User Guide*[23] (2019) for recommended questions for delayed evaluation
    - ○ *Additional Tool/Information:*
        - ■ Refer to the Centers for Disease Control and Prevention's (CDC) *Training Effectiveness Predictors* (2019) for a summary of learner characteristics, training design, and work environment predict training effectiveness (i.e., the strongest, most consistent relationship with learning and application of knowledge and skills in the workplace—transfer of learning)

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[22] Centers for Disease Control and Prevention. (2019). *Recommended Training Effectiveness Questions for Postcourse Evaluations User Guide*. Atlanta, GA: CDC, 2019. Retrieved from
[23] Ibid.

- For more information on the pitfalls of trainer-centric questions, read this post entitled "*Zero Correlation Between Student Evaluations and Learning*" which covers a new study adding to the evidence that student reviews of instructors have limited validity.

**C. *Key Factors & Techniques Linked to the Transfer of Online Training[24]***
- *Abstract*
  - The article discusses the transfer of information through electronic learning initiatives, presenting recommendations for learning and development professionals that are attempting to ensure that the training they deliver is applied by employees. An increasing number of professionals report using strategies before, during, and after training to ensure that skills and knowledge learned during training are applied on the job.  Techniques to Integrate Education (TIEs), which include evidence-based strategies specific to online training formats (e.g., sticky learning communities, threaded discussions, action plans, and learning transfer through peer-to-peer interactions) are reviewed.

- *Techniques to Integrate Education: Evidence-based strategies*
  - Popular estimates by Brent Peterson and Zenger Folkman are that 50 percent of training effectiveness is linked to what happens before and after training. Without attention to these critical time periods, as well as support and involvement from the trainee's manager, much of what is learned during training ends up on the scrap heap of what has been learned, forgotten, and never applied.
  - Many methods used in the transfer of traditional training can be used for eLearning. Trainers need to extend their awareness and application of transfer strategies employed in face-to-face training to eLearning.
  - Skilled instructional designers need to be a part of the development of every eLearning offering. Expand the role of the eLearning designer to include developing before- and after-training strategies and techniques as well as transfer strategies in the course itself.
  - Training managers need to help managers and other stakeholders understand that the goal is not to run people through the training to simply check a box, but instead to support employees' use of skills and knowledge on the job.
  - Whether deployed on mobile devices, communicated over email or

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[24] Carnes, B. (2013). The TIEs that bind: Make eLearning stick. Key factors and techniques are linked to the transfer of online training. *T+D* (Alexandria, Va.), 67(1), 38.

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delivered via other technology-related means, TIEs (Techniques to Integrate Education) can be incorporated into existing eLearning experiences to increase the on-the-job application of skills and knowledge. <u>Each has been inspired by research on effective training transfer strategies, and they can be set up in advance with little or no further attention needed.</u>

- ■ ***Sticky Learning Communities.*** These user-friendly social media "gathering places" should focus on specific eLearning classes. Provide additional information and resources for those who want or need them. Set up a "fan page" and invite participants to post success stories and lessons learned in applying the skills and knowledge learned in training. Include "you can do it" posts to help motivate trainees participating in challenging eLearning courses.
- ■ ***Threaded Discussions.*** These discussion boards that thread replies, as well as replies to replies, provide good opportunities for learner-to-learner interaction, which has been linked with better transfer of eLearning. These types of discussions also can improve critical thinking. To set up a discussion, start with an open-ended question that asks trainees to express an opinion about the content they are learning, to solve a hypothetical situation that applies the learning, or to discuss how they can apply or have applied what they learned to their work.
- ■ ***Manager Pre- and Post-Training Communications.*** Managers should receive an email when trainees complete course registration that specifies how they can support the participant's learning, such as briefly communicating with the trainee about how the training can be used in their job. Remind managers to allow time for the participant to focus on the eLearning class and to reduce interruptions. Managers also should receive a post-training email when the participant completes the training. Provide discussion points and typical situations to discuss with the trainee. Suggest to managers that they provide opportunities and assignments to practice and use what trainees learned. Most LMSs can be programmed to automatically send these course-specific emails. If not, use a distribution list.
- ■ ***Quick Response (QR) Codes.*** QR Codes are square links most often used in advertising that provide quick access to a webpage or other Internet site. Instructional designers can use these codes to link to short quizzes and brief supplemental

practice activities. The novelty will capture attention, and the link should provide opportunities for reinforcement, supplemental learning, and application tips. Embed the code in an email and participants will be able to retrieve it with a mobile device. To make a QR Code, do a browser search on "make QR Code." Some of these sites are free; others have a nominal cost.

- ■ *Action Plans.* Introduce the action plan early in the eLearning class or module. List action steps or items—or have trainees supply these—periodically throughout the eLearning course. Toward the end of the class or module, ask trainees to reduce the action items to three or five options to which they can commit. Direct them to save their final action plan or to print a copy that they can refer to when back at work. Suggest or require trainees to send a copy of their action plan to their managers. In the post-training manager communication (mentioned earlier), let managers know to expect this and ask them to discuss it with their employees.

- ■ *Strategy Link.* Participants apply learning better when they understand how it fits with the organization's mission, vision, goals, and strategic business objectives. Provide this information with a short (one to two minutes) video clip from a senior leader in an initial slide of the course. There is no need for high-level production; a talking head with a webcam is fine for this. Another option is to send the video clip or information in text form with the registration confirmation email. Encourage managers to discuss the organizational strategy, and how it links with the training content, with their employees.

- ■ *A Little Help From Friends.* Peer-to-peer interaction in eLearning leads to better learning transfer. Provide opportunities for those who are currently taking or have taken a particular eLearning class to interact with one another. Social media platforms provide good opportunities for this technique. Or send an email to previous eLearning class participants, share the names of the current participants, and ask them to reach out and discuss what they have learned and how they are using it. An initial slide in the eLearning course also can invite participants to enlist support and discussion with a friend, co-worker, or family member who has not taken the class. Provide opening questions or topics for them to discuss.

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D. ***NeuroLeadership Institute-Behavior Change Percentage Metric***[25]
- When it comes to evaluating the effectiveness of a learning solution, most people's go-to number is the Net Promoter Score (NPS). It is a number between -100 and 100 meant to essentially reflect whether people felt their time was well spent. Which would be a useful metric, except that whether people liked an intervention holds almost no bearing on whether that intervention *worked*. (In fact, some of the most effective learning is actually *disfluent*, because it engages deeper processing in the learner.)
  - Such is the inherent flaw of NPS. Learning professionals may claim, with the best of intentions, that they want to spark behavior change. They want a given program to lead to a new habit, a new way of working. But then when it is time to measure people's behavior change, those involved run a sentiment analysis instead.
- *Introducing the Behavior Change Percentage (BCP)*
  - At NeuroLeadership Instutute (NLI), they measure the success of an intervention based on the number of desired new habits generated. In other words, what is the actual behavior change taking place? They track not just NPS but *Behavior Change Percentage*, or BCP. BCP a measure of how frequently employees and managers perform a new and desired behavior.
    - NLI tracked behavior change among 734 employees working in five different organizations, from early 2018 through the end of 2019. Their guiding metric was BCP, a score that measures the frequency of behavior change in individuals.
      - In one case, they used BCP to examine how 700 employees went through NLI's GROW learning solution within a period of 30 days. The goal of the initiative was to help American Telecom employees become more flexible in the face of change. NLI found that having gone through the GROW solution, 99% of employees felt prepared and inspired to thrive through change, 91% discussed the growth mindset on a weekly basis, and 90% spotted a fixed mindset and shifted their thinking to a growth mindset at least once a week.
      - At the global tech firm Splunk, NLI measured a BCP in which 85% of the more than 3,500 managers

[25] Weller, C. (2020). *Net Promoter Score Isn't Helping You — Here's What to Track Instead. NeuroLeadership Instutute (NLI). Retrieved from* https://neuroleadership.com/your-brain-at-work/net-promoter-score-versus-behavior-change-percentage

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        participating in NLI's *DECIDE: The Neuroscience of Breaking Bias* solution began using a strategy to deliberately mitigate bias at least once a week.

- *Why BCP Works*
    - BCP tends to overshadow NPS for a couple reasons.
        - First, the science of memory shows how the hallmark NPS question — "How likely are you to recommend this learning session to a friend or colleague?" — provides unreliable data. For example, when interpreting the question individuals might focus on whether or not the learning session was fun. However, as NLI has found, the most effective learning comes from exerting effort to understand difficult concepts — an experience that might not be the most enjoyable.
        - Secondly, when people are asked to make decisions about their future behavior, respondents have a strong tendency to over-report the likelihood of "good behavior." As a result, the NPS tends to be more reflective of the person answering the question than the learning session itself.
    - Instead of relying on a score like NPS, which uses an easily biased metric as a proxy for change, BCP reflects the actual success or failure of a given intervention. The added benefit, past learning more about the current program, is that BCP data can lead to smarter, more robust feedback for future programs. Instead of asking "How do we get more people to like it?" leaders can ask "How can we create more behavior change?" — a question far more suited to produce lasting success.

E. *Learning Transfer System Inventory (LTSI)*[26]
- *Background*
    - There are a significant number of underlying variables that explain low learning transfer. These include a lack of supervisor support, job stress, training content, a lack of peer support, and many more.
    - In 2000, a group of researchers led by Elwood Holton published the Learning Transfer System Inventory (LTSI).
        - The LTSI is a self-report 16-factor inventory designed to assess individual perceptions of catalysts and barriers to the transfer of learning from work-related training.

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[26] Deller, J. (2020, February 5). *Learning Transfer System Inventories: Everything You Need to Know*. Kodo Survey; LTSI Website: http://ltsinventory.com/

- The LTSI was the first empirically tested instrument for understanding the various processes that occur around training transfer, from the training event to the workplace. The LTSI showed the validity of all factors that affect learning transfer. It helps practitioners understand the various processes that occur around training processes and shows how they interact with each other, how they are independent, and how their influence on learning transfer can be modeled.

- *Components of LTSI*
  - The LTSI questionnaire is designed to investigate the system of variables that affect learning transfer. These include:
    - Factors about the person
    - Training-related factors
    - Factors at an organization level
  - Here is a list of the 16 factors with definitions and item examples to show how the LTSI works:
    - **A) Specific Factors:** These eleven specific factors aim to gauge the extent to which the respondents felt about the course and its delivery.
      - **1. Learner readiness**
        - Learner readiness is defined as the extent to which respondents feel prepared to enter and participate in training.
        - Example: *Prior to the training, I understood how it would fit my job-related development.*
      - **2. Motivation to transfer**
        - The LTSI defines motivation to transfer as "the direction, intensity, and persistence of effort toward utilizing in a work setting skills and knowledge learned."
        - Example: *I get excited when I think about trying to use my new learning on my job.*
      - **3. Positive personal outcomes**
        - This factor refers to whether the participants feel that applying training on the job leads to positive outcomes.
        - Example: *Employees in my organization are rewarded when they utilize newly learned skills on the job.*
      - **4. Negative personal outcomes**
        - The extent to which participants believe that not applying skills and knowledge learned in training will lead to outcomes that are negative.
        - Example: *If I do not utilize my training, I will be cautioned about it.*

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**5. Personal capacity for transfer**
- This factor refers to the extent to which participants feel they have time, energy and mental space in their work lives to make changes required to transfer learning on the job.
- Example: *My typical daily workload gives me time to try new things I have learned.*

**6. Peer support**
- The extent to which peers offer reinforcement of new training and support their colleagues to use new learning on the job.
- Example: *My colleagues encourage and support me to use the skills I have learned in training.*

**7. Supervisor support**
- This factor measures the extent to which respondents feel their supervisors offer support and reinforcement of training on the job.
- Example: *My supervisor encourages me to apply my training on the job and sets goals for me.*

**8. Supervisor sanctions**
- The extent to which supervisors are perceived to impose sanctions when respondents apply newly learned skills on the job.
- Example: *My supervisor is opposed to my use of newly learned skills on the job.*

**9. Perceived content validity**
- The extent to which participants feel their training content matches their job requirements accurately.
- Example: *The training content closely matches my job requirements.*

**10. Transfer design**
- The extent to which respondents feel the training has been designed and delivered to foster learning transfer on the job.
- Example: *The training exercises and/or activities helped me apply my new learning on the job.*

**11. Opportunity to use**
- The degree to which respondents feel they were given resources that enabled them to use their newly learned skills on the job.
- Example: *I feel I have adequate resources to use what I learned on the job.*

B) **General factors:** These five general factors aim to gauge the extent to which the respondents felt about training and their organization in general.

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**12. Transfer effort performance expectations**
- This factor measures the respondent's expectation that learning will result in on-the-job changes.
- Example: *My work performance improves when I learn to use new skills on the job.*

**13. Performance outcomes expectations**
- This factor determines the respondent's expectation that on-the-job changes will result in valued outcomes.
- Example: *When I improve my performance, I receive positive benefits and outcomes.*

**14. Openness to change**
- This factor measures the extent to which the respondent believes that implementing new skills and knowledge is encouraged or discouraged by their organization or people in their group.
- Example: *My colleagues are open to implementing on-the-job changes.*

**15. Performance self-efficacy**
- This factor aims to measure the respondent's belief that they are able to change their performance.
- Example: *I feel able to implement newly learned skills on the job.*

**16. Performance coaching**
- This final factor measures both formal and informal indicators from an organization about an employee's job performance.
- Example: *I receive feedback from colleagues and supervisors about how well I am applying what I have learned.*

- *Versions of the LTSI*
  - The most recent validated LTSI is the third version. This latest version of the LTSI emerged following 10 years of research around the world.
    - Combining data from 6,120 people in 17 countries and 14 different languages, they were able to reduce the length of the instrument significantly.
    - In addition, in version three developers identified survey items that work across cultures and languages including Chinese, Malaysian, Farsi, Arabic, Greek, French, Spanish-and more. The 16 factors have been confirmed in all these languages.
- *Research on/Testing of LTSI*
  - The LTSI is commonly used by organizations that are seeking to understand and promote learning transfer by focusing on the relationship between social support in the workplace (peer support,

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supervisor sanctions) and learning transfer from training, the LTSI
produces statistically significant insights into the variance in ratings of
job performance.

○ Since its release, the LTSI has a 15-year track record of scientific
research and has been reexamined and retested by various
researchers.

■ In 1997, Christelle Devos et al. published The Learning
Transfer System Inventory (LTSI) translated into French:
internal structure and predictive validity in the *International
Journal of Training and Development.* The aim of this study
was to contribute to the improvement of the LTSI. A team of
researchers administered the LTSI to "328 participants from six
companies during the week following the end of a training
program". The study revealed strong support for the 16-factor
structure of the original LTSI.

■ In 2012, Reid Bates, Elwood F. Holton III & John Paul Hatala
(2012) published A revised learning transfer system inventory:
factorial replication and validation, in the *Human Resource
Development International.* Their study included further
research on the construct validity of the LTSI. Data was
collected in 17 countries and utilized 14 different language
versions of the LTSI. Results provided strong support for the
five- and 11- factor structure of the program-specific and
training-general domains of a 48-item
LTSI.

■ For additional studies on the LTSI refer to The Research
Behind the LTSI.

F. *The New World Kirkpatrick Model*[27]

● The original model to measure the transfer of training became outdated, and
as a result recent updates have been made. The original four levels of
training evaluation have been clarified with the *New World Kirkpatrick Model*.
Below is an outline of the updated Kirkpatrick Model of training evaluation
with the original definitions and new explanations.

● **Level 1: Reaction**
The degree to which participants find the training favorable, engaging,
and relevant to their jobs

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[27] Kirkpatrick, D., Kirkpatrick, J., Kirkpatrick, W. (2020, November 16). *The New World Kirkpatrick Model.*
Kirkpatrick Partners. https://www.kirkpatrickpartners.com/Our-Philosophy/The-New-World-Kirkpatrick-Model

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- ○ **Customer Satisfaction**
  - ■ The original definition measured only participant satisfaction with the training.
- *New World Additions:*
  - ○ **Engagement**
    - ■ The degree to which participants are actively involved in and contributing to the learning experience
  - ○ **Relevance**
    - ■ The degree to which training participants will have the opportunity to use or apply what they learned in training on the job

- ● **Level 2: Learning**
  The degree to which participants acquire the intended knowledge, skills, attitude, confidence, and commitment based on their participation in the training
  - ○ **Knowledge** *"I know it."*
  - ○ **Skill** *"I can do it right now."*
  - ○ **Attitude** *"I believe this will be worthwhile to do on the job."*
- *New World Additions:*
  - ○ **Confidence** *"I think I can do it on the job."*
  - ○ **Commitment** *"I intend to do it on the job."*

- ● **Level 3: Behavior**
  The degree to which participants apply what they learned during training when they are back on the job
  - *New World Addition:*
    - ○ **Required Drivers**
      - ■ Processes and systems that reinforce, encourage, and reward performance of critical behaviors on the job

- ● **Level 4: Results**
  The degree to which targeted outcomes occur as a result of the training and the support and accountability package
  - *New World Addition:*
    - ○ **Leading Indicators**
      - ■ Short-term observations and measurements suggesting that critical behaviors are on track to create a positive impact on desired results

*Recommendation:* Implement *The New World Kirkpatrick Model* with a consideration of the [Kirkpatrick Foundational Principles](#) for increased impact.

**G.** *Beyond Kirkpatrick: Three Approaches to Evaluating eLearning[28]*
- Evaluating the effectiveness of eLearning is a key element of Learning and Development (L&D) teams' work: It is needed both to improve on their efforts and to demonstrate the value of what they do. It is also notoriously difficult.
- For decades, the Kirkpatrick Model has been the default approach to evaluating eLearning and other training. But, as Jane Bozarth, The eLearning Guild's research director, points out in her recent [L&D Research Essentials](#) report, it's not the only way to measure training impact. Three alternative methods of evaluating eLearning might be worth considering.

  1) *The Learning-Transfer Evaluation Method*
     - Will Thalheimer of Work-Learning Research, Inc. researched and developed the [Learning-Transfer Evaluation Method](#), or LTEM (pronounced L-tem). It is a one page, eight-level model, augmented with color coding and descriptive explanations. LTEM focuses on the different stages of learning and the transfer of that learning to an applied environment.[29]
     - LTEM is a response to and expansion of the Kirkpatrick Model; it is aligned with learning science and "is intentionally designed to catalog a more robust set of requirements than the Kirkpatrick-Katzell model—requirements targeted to overcome the most urgent failures in learning practice," according to a 34-page report: [The Learning-Transfer Evaluation Model: Sending Messages to Enable Learning Effectiveness](#) Thalheimer wrote to accompany the one-page model summary. The report describes the need for the model, the rationale for its design, and recommendations on how to use it.

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[28] Hogle, P. (2019). [Beyond Kirkpatrick: Three Approaches to Evaluating eLearning.](#) Learning Solutions.
[29] The most recent and final revisions to the model for the foreseeable future were in May 2018.

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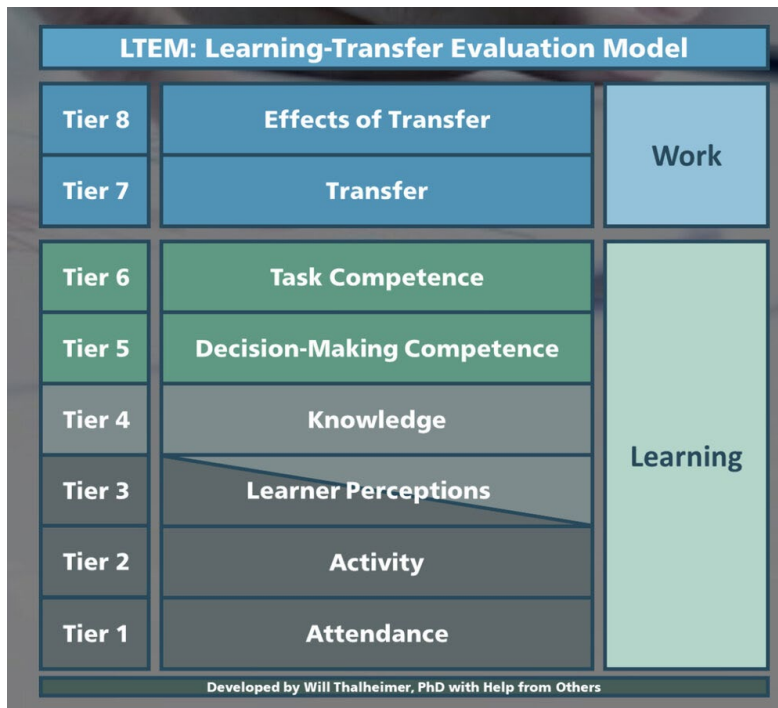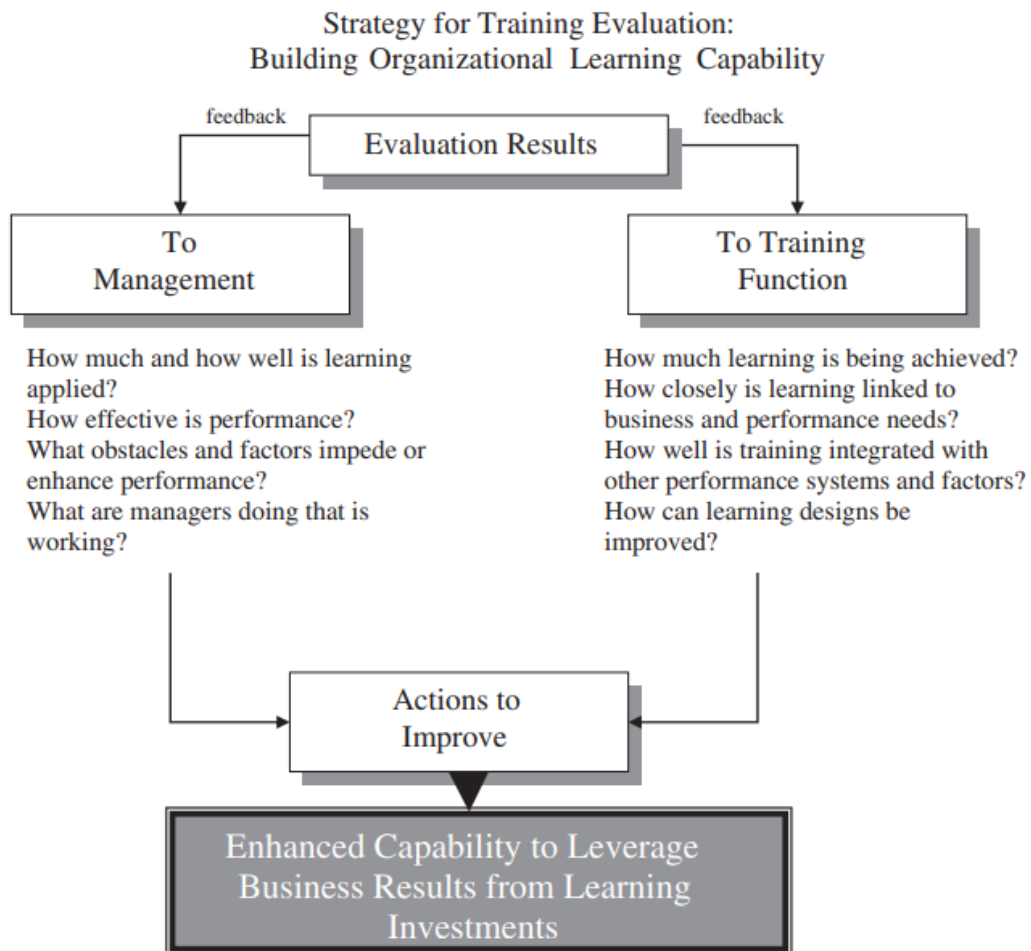


- The lowest levels of LTEM resemble Kirkpatrick Levels 1 and 2 (what has traditionally been the focus of corporate training—short-term retention), measuring attendance at, completion of, and participation in learning activities. Measuring presence or attention does not, validate learning; these activities alone do not indicate learning.
- LTEM's third tier measures learners' perceptions. A common misapplication of Kirkpatrick and "smile sheets" is to conflate positive learner response to eLearning with actual learning. Simply enjoying an activity—or even believing that it will help you on the job—is not an indication that you have learned something from the activity. Thalheimer divides his level three into two categories, depending on the rigor of the questions posed to learners about their experience.
- Levels four, five, and six begin to address what learners got out of the eLearning (describing longer-term learning and understanding): Do they remember facts and terms? Given a realistic scenario, do they make competent decisions? Can they perform related tasks competently? Do they still remember, make good decisions, or perform new skills several days after the learning event? These

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> levels still address hypotheticals, though—performance on a quiz or in a learning scenario.
> - Finally, the top tiers illustrate where learning shifts into full application and integration on the job. Level seven moves into learning transfer: How do learners perform on the job? And the top level, eight, moves beyond the learner to look at the effects of learning and transfer of that learning on the learners, their colleagues, their organization—and beyond.
> ○ According to Thalheimer, only levels five through eight provide information that validates that learning has occurred.
> ○ Thalheimer authored *Evaluating Learning*, an eLearning Guild research report that explores how L&D teams evaluate learning and how they would like to improve those efforts.

## 2) The Success Case Method

### Strategy for Training Evaluation: Building Organizational Learning Capability

feedback ⟶ **Evaluation Results** ⟵ feedback

**To Management**

How much and how well is learning applied?
How effective is performance?
What obstacles and factors impede or enhance performance?
What are managers doing that is working?

**To Training Function**

How much learning is being achieved?
How closely is learning linked to business and performance needs?
How well is training integrated with other performance systems and factors?
How can learning designs be improved?

**Actions to Improve**

**Enhanced Capability to Leverage Business Results from Learning Investments**

- A system-level view of evaluation, *Robert Brinkerhoff's Success Case Method* acknowledges that the success of training relies in part on organizational factors; looking only at training is unlikely to create sustained performance improvements. "When training is simply "delivered" as a separate intervention, such as a stand-alone program or seminar, it does little to change job performance," Brinkerhoff wrote.
- Brinkerhoff suggests focusing on three questions:
  - How well is our organization using learning to drive needed performance improvement?
  - What is our organization doing that facilitates performance improvement from learning? What needs to be maintained and strengthened?
  - What is our organization doing, or not doing, that impedes performance improvement from learning? What needs to change?
  These questions should be part of an evaluation strategy that aims to build capacity throughout the organization to improve training and performance.
- A Success Case Method (SCM) study entails:
  - Identifying teams or individuals who have successfully applied training to achieve improved performance and/or business results.
  - Interviewing individuals and documenting their success.
  - In nearly all SCM studies, cases on "nonsuccess" are also examined, with close attention to organizational and other factors that differed between successful and unsuccessful cases.
  "Just as some small groups have been very successful in applying a new approach or tool, there are likewise other small groups at the other extreme that experienced no use or value. Investigating the reasons for lack of success can be equally enlightening. Comparisons between the groups are especially useful," Brinkerhoff wrote.

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2)  ***The CIPP Evaluation Model***
    ○  The *[Context, Input, Process, and Product (CIPP) Evaluation Model](#)*, devised by Daniel Stufflebeam, may be useful to evaluate a curriculum, academy, or multi-course certification workshop. It provides a systematic approach to examining the curriculum development process, rather than examining either the learning product or the results.
    ○  The CIPP Model can be used to guide the design, development, and assessment of learning projects and to evaluate the effectiveness of the learning program. In using CIPP to guide curriculum or learning design, and to evaluate the results, Learning and Development practitioners should examine:
        ■  *Context:* What are the goals? Is eLearning needed? How does this eLearning project relate to other training materials?
        ■  *Inputs:* Consider the target audience of learners. What knowledge do they already have? What materials and devices are available? What practical problems will the eLearning help them solve?
        ■  *Process:* Will learners have opportunities to use and apply the information and skills during training? What is the environment where they will consume and use the eLearning? How will the learning process be evaluated?
        ■  *Product:* What type(s) of assessment will be used? Will assessment occur during or only at the end of the eLearning? What will be assessed? How do learners use what they were taught? What were the outcomes and how do they compare with the goals?

    These questions can be asked during all stages of learning design, development, and implementation—they need not be left for post-eLearning evaluation. In fact, a unique aspect of the CIPP Model is that it is meant to be used throughout the process, while other methods look only at whether training "worked."

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**H. *Development and Validation of a Questionnaire to Evaluate Factors Influencing Training Transfer (FITT) Among Nursing Professionals[30]***
- *Purpose/Background*
  - The purpose of this study was to develop and validate a questionnaire to evaluate the scores of factors influencing training transfer (FITT) among nursing professionals.
  - The key criterion for evaluating training effectiveness is the transfer of training.[31] Transfer of training is defined as the extent to which knowledge, skills, and attitudes learned in work-related training are applied on the job and subsequent maintenance of them over a certain period of time.[32]
  - Health care managers need to understand the factors influencing training transfer for maximizing the benefits of training. The right beliefs and values about training, the rigorous employee selection for training, the relevance of training content, training instructions facilitating learning and transfer, supports from peer, supervisors and the organization, organizational culture such as change, sharing, learning and support, and professional development are key to successful training transfer. Furthermore, managers should be aware of the opposition from co-workers and find ways to prevent it.
- *Methods*
  - Included assessment of past tools to build foundational research for finding a "comprehensive, generalizable, valid instrument of factors that influence training transfer" to ultimately enhance return on investment/ training effectiveness.
  - The new questionnaire was developed by item generation through interviews with nurses and a literature review.
  - The FITT was validated in terms of content validity through expert reviews.
  - Psychometric properties of the final instrument were assessed in a sample of 960 nurses with training experiences.
- *Tool Content*
  - A two-part questionnaire was developed on the basis of the 63 items. The first part asks respondents to describe their personal

[30]Bai, Y., Li, J., Bai, Y. et al. (2018). Development and validation of a questionnaire to evaluate the factors influencing training transfer among nursing professionals. *BMC Health Serv Res 18*, 107.
[31] Kirkpatrick DL, Kirkpatrick JD. (2007). *Implementing the four levels : a practical guide for effective evaluation of training programs.* San Francisco: Berrett-Koehler Publishers.
[32] Bates R, Holton EF, III, Hatala JP. (2012) A revised learning transfer system inventory: factorial replication and validation. *Hum Resource Dev Int.;15*:549–569. doi: 10.1080/13678868.2012.726872.

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characteristics/demographics. The second part consists of 63 items to which responses are given using a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree).

- The 63 items of the FITT are organized into five factors:
  - Factor 1 (20 items)- managerial support
  - Factor 2 (6 items)- hindrances in the organization
  - Factor 3 (10 items)- validity of training program
  - Factor 4 (11 items)-organizational and personal facilitators
  - Factor 5 (6 items)-personal attitude toward training transfer
- Refer here for a table with the *FITT questionnaire items*

- *Results*
  - Although more research is needed to strengthen the future development of the FITT, preliminary findings suggest that this tool is a well-validated and reasonably comprehensive instrument for diagnosing the factors that affect training transfer among nursing professionals.
  - The FITT can be used to assess individual perceptions of catalysts and barriers to the transfer of training among nursing professionals (e.g., personal, training, and environment aspects), which can help promote training transfer and training effectiveness in the workplace.

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