

Theory of Action



Compilation of Supporting Research and Literature

Theories of action are statements that articulate a rationale for improved outcomes associated with strategic changes and actions. EVERFI collaborated with Empirical Education to develop a well-defined logic model grounded in substantiated theories of action. These statements, coupled with EVERFI's logic model, highlight unique features found in our K-12 product's content and experience. This document provides research and literature from the field supporting each statement that guided our product development and design.

Theory of Action Statements

1. When teachers have access to digital content that addresses content not sufficiently covered by standard curriculums, student success will be supported in the classroom and beyond.
2. When students are provided learning experiences that are interactive and mimic real-world examples, learning is more relevant and engaging.
3. When students are enabled to consume content at their own pace, they demonstrate agency and are more likely to be engaged with the content.
4. When students are given safe opportunities to practice and receive timely feedback during learning, both educators and students are enabled to make just-in-time adjustments to support success.

Theory of Action Statement 1

When teachers have access to digital content that addresses content not sufficiently covered by standard curriculums, student success will be supported in the classroom and beyond.

1. State mandated financial education and the credit behavior of young adults

Brown, A., Collins, J. M., Schmeiser, M. D., & Urban, C. (2014). *State mandated financial education and the credit behavior of young adults* (FEDS Working Paper No. 2014-68). Finance and Economics Discussion Series. [URL](#)

From the Abstract

“In the U.S., a number of states have mandated personal finance classes in public school curricula to address perceived deficiencies in financial decision-making competency. Despite the growth of financial and economic education provided in public schools, little is known about the effect of these programs on the credit behaviors of young adults. Using a panel of credit report data, we examine young adults in three states where personal financial education mandates were implemented in 2007: Georgia, Idaho, and Texas. We compare the credit scores and delinquency rates of young adults in each of these states pre- and post-implementation of the education to those of students in a synthetic control state and then bordering states without financial education. We find that young people who are in school after the implementation of a financial education requirement have higher relative credit scores and lower relative delinquency rates than those in control states.”

2. Respected: Perspectives of youth on high school and social and emotional learning

DePaoli, J. L., Atwell, M. N., Bridgeland, J. M., & Shriver, T. P. (2018). *Respected: Perspectives of youth on high school and social and emotional learning. A report for CASEL*. Civic, Hart Research Associates. [URL](#)

From the Abstract

“The central message of this report is while current and recent high school students today generally respect their teachers and give their high schools favorable marks, most see a big missing piece in their education -- a lack of social and emotional skills development -- and most recent students feel unprepared for life after high school. Students, like teachers and administrators, see the benefits of attending schools that emphasize social and emotional learning (SEL), especially in terms of improving relationships, reducing bullying, and preparing them for postsecondary education, work, and life. Such schools are broadly appealing to students across backgrounds and from different types of schools. Encouragingly, students in schools with a strong commitment to social and emotional development report having better learning environments, feeling respected more, feeling safer, doing better academically, getting along well with others better, being better prepared for life, and being more likely to serve and give back to their communities than those students not in such schools. These and other findings are the result of a nationally representative survey of current (age 14-19) and recent (age 16-22) high school students, including in-depth interviews with students in schools with and without a strong focus on social and emotional learning. Listening to the perspectives of students completes a compelling picture that has included nationally representative surveys of pre-kindergarten through twelfth grade teachers and principals to assess the role and value of social and emotional learning in America's schools. The survey findings have three major themes: (1) Students and young adults from strong SEL schools report a more positive social climate and learning environment, doing better academically, and being better prepared for life than those in weak SEL schools; (2) Schools that emphasize

social and emotional skill development are broadly appealing to students across background, race, ethnicity, income, geography, and type of school attended and students see the benefits of such schools, but fewer than half believe their high schools are doing a good job of helping them develop SEL skills; and Students -- particularly some of the most vulnerable -- cite social and emotional problems as significant barriers to learning, doing their best, and fulfilling their potential. Throughout the report, perspectives of current and recent high school students are shared, providing a clearer picture of how they view their high schools, what their challenges are, and how their schools could be improved to unleash more of their potential. Findings related to the perspectives of students from different backgrounds are also presented in an effort to promote an equitable approach to understanding students' experiences in high school. Finally, what research says about the integration of social, emotional, and academic development is highlighted and recommendations are provided on how to advance the strategic and systemic use of youth voice and SEL in schools to promote student success in school, work and civic life."

3. Financial education affects financial knowledge and downstream behaviors

Kaiser, T., Lusardi, A., Menkhoff, L., & Urban, C. (2021). Financial education affects financial knowledge and downstream behaviors. *Journal of Financial Economics*, 145 (2), 255-272. [URL](#)

From the Abstract

"We study the rapidly growing literature on the causal effects of financial education programs in a meta-analysis of 76 randomized experiments with a total sample size of over 160,000 individuals. The evidence shows that financial education programs have, on average, positive causal treatment effects on financial knowledge and downstream financial behaviors. Treatment effects are economically meaningful in size, similar to those realized by educational interventions in other domains, and are at least three times as large as the average effect documented in earlier work. These results are robust to the method used, restricting the sample to papers published in top economics journals, including only studies with adequate power, and accounting for publication selection bias in the literature. We conclude with a discussion of the cost-effectiveness of financial education interventions."

4. Promoting positive youth development through school-based social and emotional learning interventions: A meta-analysis of follow-up effects

Taylor, R. D., Oberle, E., Durlak, J. A., & Weissberg, R. P. (2017). Promoting positive youth development through school-based social and emotional learning interventions: A meta-analysis of follow-up effects. *Child Development*, 88(4), 1156-1171. [URL](#)

From the Abstract

"This meta-analysis reviewed 82 school-based, universal social and emotional learning (SEL) interventions involving 97,406 kindergarten to high school students ($M_{\text{age}} = 11.09$ years; mean percent low socioeconomic status = 41.1; mean percent students of color = 45.9). Thirty-eight interventions took place outside the United States. Follow-up outcomes (collected 6 months to 18 years postintervention) demonstrate SEL's enhancement of positive youth development. Participants fared significantly better than controls in social-emotional skills, attitudes, and indicators of well-being. Benefits were similar regardless of students' race, socioeconomic background, or school location. Postintervention social-emotional skill development was the strongest predictor of well-being at follow-up. Infrequently assessed but notable outcomes (e.g., graduation and safe sexual behaviors) illustrate SEL's improvement of critical aspects of students' developmental trajectories."

5. Empowering digital citizenship: An anti-cyberbullying intervention to increase children's intentions to intervene on behalf

Vlaanderen, A., Bevelander, K. E., & Kleemans, M. (2020). Empowering digital citizenship: An anti-cyberbullying intervention to increase children's intentions to intervene on behalf of the victim. *Computers in Human Behavior*, 112, 106459. [URL](#)

From the Abstract

“Cyberbullying rates among children are worrisome and the consequences of cyberbullying can be detrimental. Theory-based interventions to reduce cyberbullying are lacking. Therefore, this study examined whether an online anti-cyberbullying intervention based on the Theory of Planned Behavior could increase children's intention to intervene in cyberbullying incidents on behalf of the victim. An experiment (N = 298, 10–12 years old) was conducted to investigate whether the intervention could positively affect the behavioral intention to intervene on behalf of the victim via changes in children's attitude, subjective norms, and perceived behavioral control. Results showed that children exposed to the anti-cyberbullying intervention had more intentions to intervene on behalf of the cyberbully victim compared to children who were exposed to a non-related intervention. However, no mediation effects were found for children's attitude, subjective norms, and perceived behavioral control. The effectiveness of the intervention in the current study shows that it is important to develop theory-based intervention programs that also focus on the role of bystanders.”

6. Consumer financial education and financial capability

Xiao, J. J., & O'Neill, B. (2016). Consumer financial education and financial capability. *International Journal of Consumer Studies*, 40(6), 712-721. [URL](#)

From the Abstract

“The purpose of this study was to explore potential effects of financial education on the financial capability of American consumers. Data from the 2012 National Financial Capability Study were used to test the hypothesis that financial education is positively associated with financial capability. Four financial literacy and behaviour variables were used to form a financial capability index. Multivariate linear regression results showed that, after controlling for demographic and financial variables, respondents who ever received financial education had higher scores in all financial capability indicators (objective financial literacy, subjective financial literacy, desirable financial behaviour, perceived financial capability and the financial capability index). In addition, high school, college and workplace financial education variables showed positive associations with these financial capability indicators. Additional state comparison analyses provided evidence suggesting high school financial education may have direct impacts and spillover effects on consumer financial capability.”

7. Age-specific life skills education in school: A systematic review

Kirchhoff, E., & Keller, R. (2021). Age-specific life skills education in school: A systematic review. *Frontiers in Education*, 6, 221. [URL](#)

From the Abstract

“Strengthening life skills is a popular approach for prevention and health promotion in schools. It aims to empower students to deal effectively with the demands of everyday life by improving self-regulation, making informed decisions, and building supportive social relationships. By addressing various health-related topics such as friendship, sexuality, violence, or substance use, life skills education has the potential not only to teach students how to act responsively regarding their health and well-being, but also to build a comprehensive understanding of the biological, psychological, and social factors influencing their individual development. However, little is known about whether the contents of life skills programs differ depending on student age, either in terms of the set of skills promoted or the influencing factors on health that are the focus. This systematic review addressed this gap by analyzing evaluated school-based life skills programs regarding age-specific targeted life skills, underlying theoretical frameworks, and effectiveness.

The analysis, following the PRISMA guidelines, was based on longitudinal evaluation studies published between 2007 and 2020, which were retrieved from six electronic databases, and referred to eighteen programs. Results showed that programs were mostly implemented in adolescence and that the targeted life skills shifted from a more behavioral-affective focus in childhood to a broader set of life skills targeted in adolescence which emphasized social and sociocultural influencing factors on health. Little evidence was available on the effectiveness of the programs on life skills development. Ultimately, life skills education promotes health-related self-regulation, especially in adolescence. However, further research is needed to clarify how to achieve sustainable effects in the development of life skills, both in childhood and adolescence.”

8. A narrative systematic review of life skills education: Effectiveness, research gaps, and priorities

Nasheeda, A., Abdullah, H. B., Krauss, S. E., & Ahmed, N. B. (2019). A narrative systematic review of life skills education: effectiveness, research gaps and priorities. *International Journal of Adolescence and Youth*, 24(3), 362-379. [URL](#)

From the Abstract

“A systematic review was conducted to investigate the literature on effectiveness of life skills programs. The aim of this review was to gain a comprehensive understanding on the effectiveness of life skills education globally, and to identify research gaps and priorities. Findings revealed differences in life skills education within developing countries and developed countries. In general, developed countries conduct more systematic life skills education programs promoting positive behavior, with research articulating outcomes on individual youth. In contrast, the majority of developing countries’ life skills programs lack systematic implementation, evaluation and monitoring. Programs are often conducted to yield short term results only. This review will be useful to administrators, policy makers, researchers and teachers to implement effective life skills programs. The findings can be used as inputs for developing sustainable life skills programs to ensure transfer of knowledge and skills.”



Theory of Action Statement 2

When students are provided learning experiences that are interactive and mimic real-world examples, learning is more relevant and engaging.

1. Digital games, design, and learning: A systematic review and meta-analysis

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research*, 86(1), 79-122. [URL](#)

From the Abstract

“In this meta-analysis, we systematically reviewed research on digital games and learning for K-16 students. We synthesized comparisons of game versus nongame conditions (i.e., media comparisons) and comparisons of augmented games versus standard game designs (i.e., value-added comparisons). We used random-effects meta-regression models with robust variance estimates to summarize overall effects and explore potential moderator effects. Results from media comparisons indicated that digital games significantly enhanced student learning relative to nongame conditions ($g[\bar{g}] = 0.33$, 95% confidence interval [0.19, 0.48], $k = 57$, $n = 209$). Results from value-added comparisons indicated significant learning benefits associated with augmented game designs ($g[\bar{g}] = 0.34$, 95% confidence interval [0.17, 0.51], $k = 20$, $n = 40$). Moderator analyses demonstrated that effects varied across various game mechanics characteristics, visual and narrative characteristics, and research quality characteristics. Taken together, the results highlight the affordances of games for learning as well as the key role of design beyond medium.”

2. Realistic authenticity

Fougt, S. S., Misfeldt, M., & Shaffer, D. W. (2019). Realistic authenticity. *Journal of Interactive Learning Research*, 30(4), 477-504. [URL](#)

From the Abstract

“This study explores the concept of authenticity in education, which has been, over the last 25 years, a powerful metaphor for educational practice, particularly as a guiding principle for some technological innovations that support student learning. The concept of authenticity has a variety of meanings, although a dominant interpretation is that authenticity refers to the alignment of educational practice with activities in the real world. Based on a meta-analysis of research on the topic, Shaffer and Resnick (1999) proposed unifying the array of meanings for authenticity with their concept of thick authenticity, which included four different aspects of authentic learning: real-world, assessment, disciplinary, and personal authenticity. Thick authenticity synthesizes these different facets into a mutually interdependent whole. This study revisits this discussion two decades later, again conducting a meta-review of recent literature, and re-finding the four meanings for authenticity. However, we also identify in the current literature on authenticity a fifth meaning: teacher authenticity. We then analyze two cases of technology-based teaching to explore how teachers manage the elements of authenticity in their classrooms, what this tells us about the theoretical construct of thick authenticity, and specifically the role that teacher authenticity plays in the orchestration of authentic learning. Based on these short case studies, we argue that teacher authenticity does play a key role in the construction of authentic classroom activities, but that the different elements of authenticity also conflict with and limit one another. As a result, educators need to pay more careful attention to the relationships and contradictions inherent in authentic pedagogy, and balance the different aspects of authenticity rather than focusing on maximizing any one of them. We describe this aligned and coherent

understanding of authentic learning as realistic authenticity. Thus, while the primary finding of this study is from the meta-analysis of the literature, the empirical examples illustrate the results of this meta analysis, showing the complexity of authentic learning.”

3. Culturally Responsive Teaching: Theory, Research, and Practice

Gay, G. (2018). *Culturally Responsive Teaching: Theory, Research, and Practice*. Teachers College Press. [URL](#)

From the Description

“Geneva Gay is renowned for her contributions to multicultural education, particularly as it relates to curriculum design, professional learning, and classroom instruction. Gay has made many important revisions to keep her foundational, award-winning text relevant for today's diverse student population, including: new research on culturally responsive teaching, a focus on a broader range of racial and ethnic groups, and consideration of additional issues related to early childhood education. Combining insights from multicultural education theory with real-life classroom stories, this book demonstrates that "all" students will perform better on multiple measures of achievement when teaching is filtered through students' own cultural experiences. This perennial bestseller continues to be the go-to resource for teacher professional learning and preservice courses. While retaining its basic organization and structure, the Third Edition features: (1) New research that validates the positive effects of culturally responsive teaching. Examples that broaden the racial and ethnic groups that can benefit from culturally responsive teaching; (2) More information on the needs and benefits of culturally responsive teaching with young children; (3) More attention to the quality of life for students of color in colleges and universities; and (4) The addition of Practice Possibilities at the end of chapters that describe how culturally responsive teaching can be implemented.”

4. A meta-analysis with examination of moderators of student cognition, affect, and learning outcomes while using serious educational games, serious games, and simulations

Lamb, R. L., Annetta, L., Firestone, J., & Etopio, E. (2018). A meta-analysis with examination of moderators of student cognition, affect, and learning outcomes while using serious educational games, serious games, and simulations. *Computers in Human Behavior*, 80, 158-167. [URL](#)

From the Abstract

“Educational games and simulations provide teachers with powerful tools for teaching students in the sciences. Within the broad category of educational gaming, there are several types of games to include Serious Educational Games (SEG), Educational Simulations (ES), and Serious Games (SG). The purpose of this meta-analysis is to characterize and compare outcomes related to serious educational games, serious games, and educational simulations as they are presented in the educational literature. Specifically the authors intend to fill gaps left by previous studies, include major findings, and assess the current state of the field related to the use of these innovative technologies. The results of this study are in line with previous studies suggesting higher cognitive gains and increases in positive affect toward learning from subjects using SEGs, SGs, and ES. Effects were calculated from 46 empirical experimental studies. The examined studies suggest that ES, SGs, and SEGs do not differ in a statistically significant way when compared to traditional instruction but do differ from each other. More to this point, effect size outcomes are suggestive of a cumulative medium effect for cognition ($d=.67$) and affect ($d=.51$) with a small effect for behavior ($d=.04$).”

5. Fostering adolescents' value beliefs for mathematics with a relevance intervention in the classroom.

Gaspard, H., Dicke, A.-L., Flunger, B., Brisson, B. M., Häfner, I., Nagengast, B., & Trautwein, U. (2015). Fostering adolescents' value beliefs for mathematics with a relevance intervention in the classroom. *Developmental Psychology*, 51(9), 1226–1240. [URL](#)

From the Abstract

“Interventions targeting students' perceived relevance of the learning content have been shown to effectively promote student motivation within science classes (e.g., Hulleman & Harackiewicz, 2009). Yet, further research is warranted to understand better how such interventions should be designed in order to be successfully implemented in the classroom setting. A cluster randomized controlled study was conducted to test whether ninth-grade students' value beliefs for mathematics (i.e., intrinsic value, attainment value, utility value, and cost) could be fostered with relevance interventions in the classroom. Eighty-two classrooms were randomly assigned to one of two experimental conditions or a waiting control condition. Both experimental groups received a 90-minute intervention within the classroom on the relevance of mathematics, consisting of a psychoeducational presentation and relevance-inducing tasks (either writing a text or evaluating interview quotations). Intervention effects were evaluated via self-reports of 1916 participating students six weeks and five months after the intervention in the classroom. Both intervention conditions fostered more positive value beliefs among students at both time points. Compared to the control condition, classes in the quotations condition reported higher utility value, attainment value, and intrinsic value, and classes in the text condition reported higher utility value. Thus, stronger effects on students' value beliefs were found for the quotations condition than for the text condition. When assessing intervention effects separately for females and males, some evidence for stronger effects for females than for males was found.”

6. Making learning personally meaningful: A new framework for relevance research

Priniski, S. J., Hecht, C. A., & Harackiewicz, J. M. (2018). Making learning personally meaningful: A new framework for relevance research. *The Journal of Experimental Education*, 86(1), 11-29. [URL](#)

From the Abstract

“Personal relevance goes by many names in the motivation literature, stemming from a number of theoretical frameworks. Currently these lines of research are being conducted in parallel with little synthesis across them, perhaps because there is no unifying definition of the relevance construct within which this research can be situated. In this paper we propose a new framework to synthesize existing research on relevance and provide a common platform for researchers to communicate and collaborate. In light of this new framework we review the role of relevance in three prominent theories in the motivation literature: the four-phase model of interest development (Hidi & Renninger, 2006), expectancy-value theory (Eccles et al., 1983), and self-determination theory (Deci & Ryan, 1985). We then explore eight relevance constructs commonly used in the literature and the educational interventions that derive from them. Finally, we offer a synthesis of these constructs and suggest some directions for future research.”

7. The Cambridge Handbook of Motivation and Learning

Renninger, K. A., & Hidi, S. E. (2019). *The Cambridge handbook of motivation and learning*. Cambridge University Press. [URL](#)

From the Description

“Written by leading researchers in educational and social psychology, learning science, and neuroscience, this edited volume is suitable for a wide-academic readership. It gives definitions of key terms related to motivation and learning alongside developed explanations of significant findings in the field. It also presents cohesive descriptions concerning how motivation relates to learning, and produces a novel and insightful combination of issues and findings from studies of motivation and/or learning across the authors' collective range of scientific fields. The authors provide a variety of perspectives on motivational constructs and their measurement, which can be used by multiple and distinct scientific communities, both basic and applied.”

8. A meta-analysis on the influence of gamification in formal educational settings on affective and behavioural outcomes

Ritzhaupt, A.D., Huang, R., Sommer, M., Zhu, J., Stephen, A., Valle, N., Hampton, J. & Li, J. (2021). A meta-analysis on the influence of gamification in formal educational settings on affective and behavioral outcomes. *Educational Technology Research and Development*, 69(5), 2493-2522. [URL](#)

From the Abstract

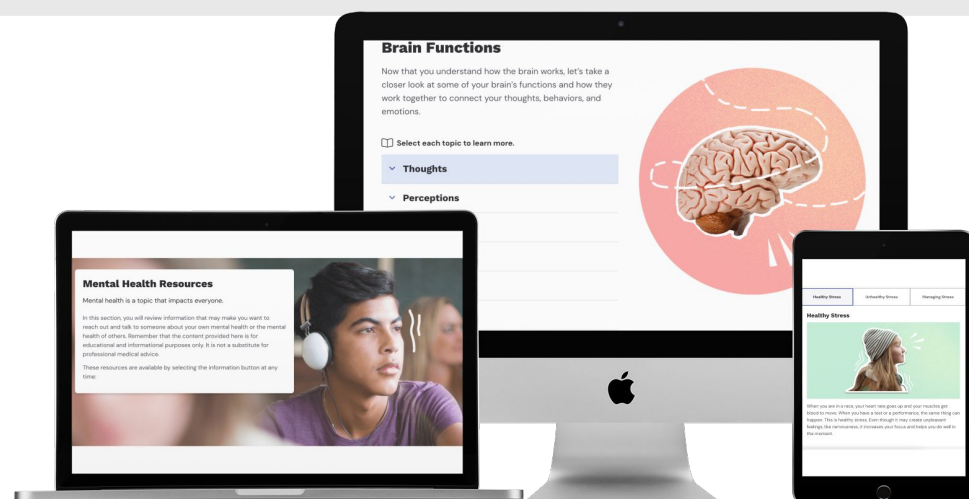
“The purpose of this study was to examine the effects of gamification used in formal educational settings on student affective and behavioral outcomes. Using systematic procedures to identify and screen the manuscripts across 18 academic databases, we identified 13 studies with behavioral outcomes and 19 studies with affective outcomes employing gamification in educational settings. These manuscripts accounted for a total of $N = 1974$ ($n = 987$ in gamification, $n = 987$ in control) participants in the affective model, and $N = 1596$ ($n = 760$ in gamification, $n = 836$ in control) in the behavioral model. Employing random-effects models, we calculated two statistically significant medium overall effect sizes for affective outcomes at $g = .574$ [.384, .764] and for behavioral outcomes at $g = .740$ [.465, 1.014]. We also examined 14 different gamification design elements (e.g., leaderboards, badges, etc.) as moderators to pinpoint the conditions in which gamification may be effective. Additionally, we examined contextual elements as moderators, including the discipline, student level, and publication source. Publication bias was not identified as a threat to either the affective or behavioral model. We also provide a discussion of our findings, limitations, and suggestions for future research.”

9. The effect of simulation technique on academic achievement: A meta-analysis study

Talan, T. (2021). The effect of simulation technique on academic achievement: A meta-analysis study. *International Journal of Technology in Education and Science*, 5(1), 17-36. [URL](#)

From the Abstract

“This research aims to examine the experimental studies on the impact of simulation technique on students' academic achievement using the meta-analysis method. The previous studies that could be meta-analyzed were examined based on the criteria set out in this study. Finally, 91 studies that were conducted between 2010-2020 and met the inclusion criteria were subjected to meta-analysis. The sample of the research consisted of 7575 participants. According to the results of the analysis performed using the random-effects model, the mean effect size was calculated as $g=0.759$ with a standard error of 0.075. Based on the findings, the simulation technique can be said to have a broad impact on students' academic achievement. The results of the publication bias analysis revealed that the present meta-analysis study had no publication bias. On the other hand, the results of the moderator analysis revealed that the impact of the simulation technique on the students' academic achievement did not differ by the teaching levels, course/subject area, and application times, however, it differed by the sample size.”



Theory of Action Statement 3

When students are enabled to consume content at their own pace, they demonstrate agency and are more likely to be engaged with the content.

1. Twenty-first century adaptive teaching and individualized learning operationalized as specific blends of student-centered instructional events: A systematic review and meta-analysis

Bernard, R. M., Borokhovski, E., Schmid, R. F., Waddington, D. I., & Pickup, D. I. (2019). Twenty-first century adaptive teaching and individualized learning operationalized as specific blends of student-centered instructional events: A systematic review and meta-analysis. *Campbell Systematic Reviews*, 15(1-2), 1-35. [URL](#)

From the Abstract

“Teaching methods that individualize and adapt instructional conditions to K-12 learners' needs, abilities, and interests help improve learning achievement. The most important variables are the teacher's role in the classroom as a guide and mentor and the adaptability of learning activities and materials. This Campbell systematic review assesses the overall impact on student achievement of processes and methods that are more student-centered versus less student-centered. It also considers the strength of student-centered practices in four teaching domains: (1) Flexibility: Degree to which students can contribute to course design, selecting study materials, and stating learning objectives; (2) Pacing of instruction: Students can decide how fast to progress through course content and whether this progression is linear or iterative; (3) Teacher's role: Ranging from authority figure and sole source of information, to teacher as equal partner in the learning process; and (4) Adaptability: Degrees of manipulating learning environments, materials, and activities to make them more student-centered. This review presents evidence from 299 studies (covering 43,175 students in a formal school setting) yielding 365 estimates of the impact of teaching practices. The studies spanned the period 2000-2017 and were mostly carried out in the United States, Europe, and Australia. This review confirms previous research on the effectiveness of student-centered and active learning. It goes further in suggesting the teacher's role promotes effective student-centered learning, and excessive student control over pacing appears to inhibit it.”

2. Promoting self-paced learning in the elementary classroom with interactive video, an online course platform and tablets.

Palaiogeorgiou, G., & Papadopoulou, A. (2019). Promoting self-paced learning in the elementary classroom with interactive video, an online course platform and tablets. *Education and Information Technologies*, 24(1), 805-823. [URL](#)

From the Abstract

“Studies show that interactive educational video can reduce cognitive overload, guide viewers' attention, and trigger reflection; moreover, tablets can help students to increase self-directed learning, take ownership of the learning process, and collaborate with one another. In this study, we examine whether interactive video together with tablets and an online course learning environment can become the means for promoting efficient and effective self-paced learning in the classroom. In traditional elementary classes, students most often play a somewhat passive role in pacing and organizing their learning progress. Students in our study were asked to follow a learning path of interactive videos and other learning units in pairs while the teacher played only a supportive role. Two classes of fifth grade (30 students) and two classes of sixth

grade (30 students) exploited the proposed environment for two 90 min' sessions. The interactive videos and learning activities were designed to address students' misconceptions about heat transfer. Data were collected through pre-post tests, focus groups, attitude questionnaires for students/teachers, and researchers' observations. Students scored significantly higher in the post-test than they did in the pretest and they were very positive about the prospects of the proposed approach, which they associated with pros such as learning efficiency, learning effectiveness, self-directed learning, enjoyment, and better classroom dynamics. Students demonstrated impressive self-control, self-discipline, and learning autonomy and successfully managed their own progress. The study shows that the proposed learning setting could become a promising means of promoting self-paced interactive learning in the classroom."

3. Transforming K-12 Rural Education through Blended Learning: Barriers and Promising Practices

Werth, E., Werth, L., & Kellerer, E. (2013). *Transforming K-12 Rural Education through Blended Learning: Barriers and Promising Practices*. Northwest Nazarene University Doceo Center for Innovation in Teaching and Learning. [URL](#)

From the Abstract

"This report describes the implementation of blended learning programs in Idaho, and three key takeaways are apparent: (1) Blended learning has a positive impact on teachers; (2) Self-pacing enables students to take ownership and achieve mastery; and (3) Teachers must prepare with comprehensive teacher training. The authors emphasize the need for the field to conduct studies to challenge, adapt, and strengthen innovation. Review this report to explore potential barriers and promising practices of K-12 blended learning."

4. Students' learning performance and perceived motivation in gamified flipped-class instruction

Zainuddin, Z. (2018). *Students' learning performance and perceived motivation in gamified flipped-class instruction*. *Computers & Education*, 126, 75-88. [URL](#)

From the Abstract

"This is a pilot study aimed at examining students' learning performance and perceived motivation between a gamified flipped classroom and a non-gamified flipped classroom instructional model, based on the Self-Determination Theory (SDT). This study employed a mixed-method research approach, using three formative assessments or a post-test only design to examine students' learning achievement. Questionnaires and personal interviews were employed to support the data collection process in terms of students' perceived motivation. Fifty-six students were the respondents involved in a non-randomized experiment with a control group design. The results reveal that assessment 1 showed no significant difference between the two groups of the gamified flipped and non-gamified flipped classroom instruction ($t = 1.68, p = .474$), while assessment 2 and 3 were significantly different ($t = 5.54, p = .007 < .05$) and ($t = 10.17, p = .001 < .05$). In the present study, the findings confirm that the students were positive regarding perceived competence, autonomy, and relatedness, better performance, and were able to achieve good achievement during the tests. The survey results reveal that the gamified flip-class setting fostered better motivation and engagement. Particularly, students motivated to compete and beat other students during the gamification activities by collecting points and badges as many as possible. Four main themes emerged from the qualitative interviews, namely, (1) pre-class learning motivation, (2) pre-class competition, (3) students' learning autonomy, and (4) students' social engagement. Conclusions from this study showed that the gamified flip-class setting had successfully constructed the basic psychological needs of SDT, namely: competency, autonomy, and relatedness."

Theory of Action Statement 4

When students are given safe opportunities to practice and receive timely feedback during learning, both educators and students are enabled to make just-in-time adjustments to support success

1. The effectiveness and features of formative assessment in US K-12 education: A systematic review

Lee, H., Chung, H. Q., Zhang, Y., Abedi, J., & Warschauer, M. (2020). The effectiveness and features of formative assessment in US K-12 education: A systematic review. *Applied Measurement in Education*, 33(2), 124-140. [URL](#)

From the Abstract

“In the present article, we present a systematic review of previous empirical studies that conducted formative assessment interventions to improve student learning. Previous meta-analysis research on the overall effects of formative assessment on student learning has been conclusive, but little has been studied on important features of formative assessment interventions and their differential impacts on student learning in the United States’ K-12 education system. Analysis of the identified 126 effect sizes from the selected 33 studies representing 25 research projects that met the inclusion criteria (e.g., included a control condition) revealed an overall small-sized positive effect of formative assessment on student learning ($d = .29$) with benefits for mathematics ($d = .34$), literacy ($d = .33$), and arts ($d = .29$). Further investigation with meta-regression analyses indicated that supporting student-initiated self-assessment ($d = .61$) and providing formal formative assessment evidence (e.g., written feedback on quizzes; $d = .40$) via a medium-cycle length (within or between instructional units; $d = .52$) were found to enhance the effectiveness of formative assessments.”

2. Formative assessment and elementary school students academic achievement: A review of the evidence

Klute, M., Apthorp, H., Harlacher, J., & Reale, M. (2017). *Formative Assessment and Elementary School Student Academic Achievement: A Review of the Evidence* (REL 2017-259). Regional Educational Laboratory Central. [URL](#)

From the Abstract

“Formative assessment is a process that engages teachers and students in gathering, interpreting, and using evidence about what and how students are learning in order to facilitate further student learning during a short period of time. The process offers the potential to guide educator decisions about midstream adjustments to instruction that address learner needs in a timely manner. Formative assessment can be implemented in classrooms in various ways. For example, formative assessment can be quick and informal, such as giving students “I learned...” prompts to reflect on and discuss their progress toward lesson objectives. Formative assessment can also be more formal and involve multiple components, such as curriculum-based measurement, to frequently track and analyze individual student learning for the purpose of modifying instruction as warranted (Black & Wiliam, 1998a). Members of Regional Educational Laboratory (REL) Central's Formative Assessment Research Alliance, including principals and district administrators, indicated that teachers in the region vary widely in their understanding of formative assessment and how to use it. They wished to focus professional development efforts on formative assessment practices that have evidence of effectiveness for promoting student learning. To address this

need, this review identifies studies that examine the effectiveness of formative assessment and provides an overall average estimate of its effectiveness. Alliance members also expressed concern that teachers have difficulty finding time to use formative assessment. One approach to minimizing the formative assessment burden on teachers is to involve students more actively in the process (Black & Wiliam, 1998a). This review also compares the effectiveness of different types of formative assessment, including those directed by students and those directed by other agents, such as educators and computer software programs. The review team conducted a comprehensive search to locate research on formative assessment interventions. After screening studies for relevance, researchers certified in the U.S. Department of Education's What Works Clearinghouse (WWC) standards and procedures coded and rated each of 76 relevant studies using systematic, rigorous, scientific evidence standards modeled after the WWC study review process and standards (U.S. Department of Education, 2014b). The review team identified 23 studies that it determined had been conducted rigorously enough to have confidence that the formative assessment interventions caused the observed effects on student outcomes. Twenty-two of the studies compared academic outcomes for students participating in formative assessment with academic outcomes for students who did not participate in formative assessment. Nineteen of the 22 studies provided enough information to calculate an effect size, which describes the magnitude of the effect of the intervention. When examining the results across these 19 studies, the review team concluded that: (1) Overall, formative assessment had a positive effect on student academic achievement. On average across all the studies, students who participated in formative assessment performed better on measures of academic achievement than those who did not; (2) Formative assessment used during math instruction had larger effects, on average, than did formative assessment used during reading and writing instruction; (3) Across all subject areas (math, reading, and writing), formative assessment had larger effects on student academic achievement when other agents, such as a teacher or a computer program, directed the formative assessment; (4) For math, both student-directed formative assessment and formative assessment directed by other agents were effective; (5) For reading, other-directed formative assessment was more effective than student-directed formative assessment; and (6) For writing, the effect of other-directed formative assessment on student academic achievement was small, and not enough evidence was available to determine the effectiveness of student-directed formative assessment.”

3. Formative assessment techniques to support student motivation and achievement

Cauley, K. M., & McMillan, J. H. (2010). *Formative assessment techniques to support student motivation and achievement*. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83(1), 1-6. [URL](#)

From the Abstract

“Formative assessment can have a powerful impact on student motivation and achievement. This article discusses five key practices that teachers can use to gather important information about student understanding, provide feedback to students, and enable students to set and attain meaningful learning goals. Each of the techniques can enhance student motivation as well as achievement.”

From the Conclusion

“Formative assessment and, in particular, feedback and instructional correctives, can be a powerful technique to support student motivation and achievement. As teachers incorporate more formative assessment techniques into their day-to-day instruction, they will have information which they can use to modify their instruction. Teachers can also use this information about student understanding to help students self-assess and improve their own performance. When students focus on improvement and progress, they are more likely to adopt mastery goals and develop high self-efficacy and expectations for success. When students and teachers attribute student successes to effort, this attributions supports future successes. Formative assessment’s emphasis on instructional modifications and student improvement

supports student motivation and enables them to maintain high engagement and achievement. Using formative assessments effectively is indeed key to student motivation and achievement.”

4. Fundamentals of formative assessment for classroom teachers

Bartz, D. E. (2017). Fundamentals of formative assessment for classroom teachers. *National Forum of Teacher Education Journal*, 27(93), 1-10. [URL](#)

From the Abstract

“Formative assessment is a planned process in which assessment results are used to measure students’ progress toward mastering learning targets and for teachers to adjust instruction and content. The formative assessment process is composed of the following nine steps: (1) determining the content to be learned and taught, (2) identifying and clearly describing assessment criteria for the content, (3) determining instructional strategies as a reference point to commence instruction, (4) sharing with students their role in formative assessment, (5) administering a pre-assessment/pretest (if applicable), (6) implementing the instructional strategies, (7) collecting formative assessment data, (8) providing students with feedback from the formative assessment pointed toward learning targets, and (9) readjusting instruction for students based on the formative assessment feedback. Supplementing formative assessment through using technology can make it even more effective and has the potential to lighten the teacher’s workload. A close and objective analysis of the state-of-the-art benchmark or interim assessments reveals that they can be useful for improving student learning.”

5. Optimizing the efficiency of learning objectives through pretests

Sana, F., Forrin, N. D., Sharma, M., Dubljevic, T., Ho, P., Jalil, E., & Kim, J. A. (2020). Optimizing the Efficacy of Learning Objectives through Pretests. *CBE - Life Sciences Education*, 19(3). [URL](#)

From the Abstract

“Learning objectives (LOs) are statements that typically precede a study session and describe the knowledge students should obtain by the end of the session. Despite their widespread use, limited research has investigated the effect of LOs on learning. In three laboratory experiments, we examined the extent to which LOs improve retention of information. Participants in each experiment read five passages on a neuroscience topic and took a final test that measured how well they retained the information. Presenting LOs before each corresponding passage increased performance on the final test compared with not presenting LOs (experiment 1). Actively presenting LOs increased their pedagogical value: Performance on the final test was highest when participants answered multiple-choice pretest questions compared with when they read traditional LO statements or statements that included target facts (experiment 2). Interestingly, when feedback was provided on pretest responses, performance on the final test decreased, regardless of whether the pretest format was multiple choice or short answer (experiment 3). Together, these findings suggest that, compared with the passive presentation of LO statements, pretesting (especially without feedback) is a more active method that optimizes learning.”

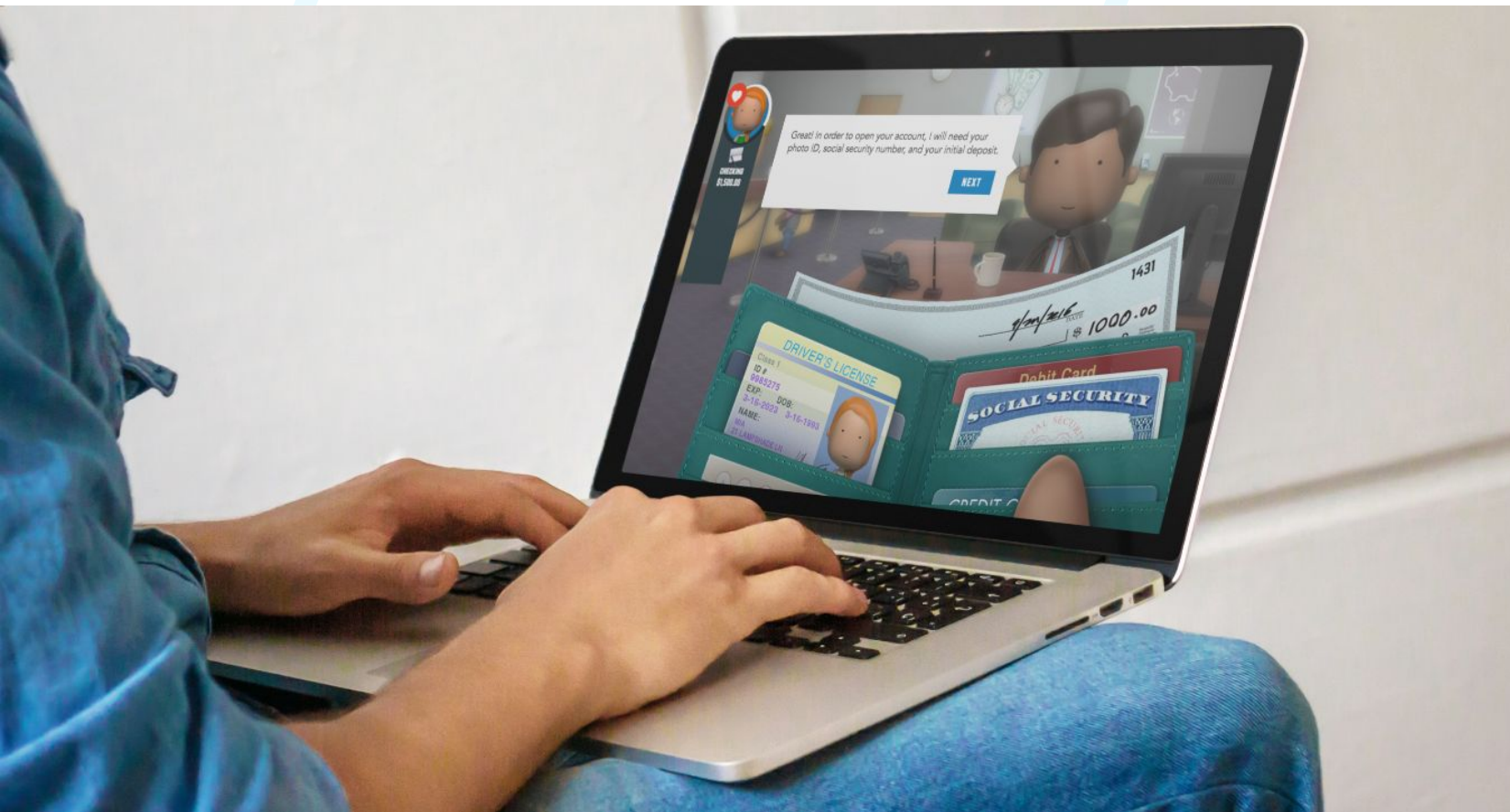
6. Embedded Formative Assessment

William, D. (2017). *Embedded Formative Assessment (Second Edition)*. Solution Tree. [URL](#)

From the Description

“By integrating classroom formative assessment practices into daily activities, educators can substantially increase student engagement and the rate of student learning. The second edition of this best-selling book by Dylan Wiliam presents new research, insights, and formative assessment strategies and techniques teachers can immediately apply in their classrooms. Updated examples and templates are included to help

teachers elicit evidence of learning, provide meaningful feedback, and empower students to take ownership of their education. Implement effective assessment strategies in the classroom by: (1) Reviewing the five key strategies of formative assessment in the classroom; (2) Learning more than 70 practical techniques for classroom formative assessment; (3) Examining research that states classroom formative assessment is the most impactful and cost-effective approach to raising student academic achievement; (4) Exploring the use of classroom questioning, learning intentions and success criteria, feedback, collaborative and cooperative learning, and self-regulated learning to engineer effective learning environments; and (5) Discovering new insights into the current states of education and employment, and a discussion of how these changes affect student performance and teacher practice.”



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