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A Research Agenda for Competency-Based Education

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This paper presents an agenda to guide, coordinate, and promote empirical research on competency-based education programs across educational sectors in the United States. Competency-based education (CBE) is an outcomes-based approach to education, where curricula are designed around competencies, and learners' progression is based solely on their performance-based demonstration of the competencies, not the amount of time they spend on the materials. CBE has the potential to address and resolve long-standing enduring challenges in education. This agenda, developed by experts in research on and the practice of competency-based education, is intended to encourage and inspire researchers with various perspectives and voices to undertake research suggested, encourage rigorous efficacy research, and provide ideas and sample research questions for scholarship. The publication of this agenda coincides with the launch of the new *Competency-Based Education Research Journal (CBERJ).* There is a significant demand for empirical evidence on CBE's efficacy, and existing literature reviews have shown that the current state of the research on CBE has gaps. The research agenda is organized in a four-part framework: (1) conceptualization research, (2) design research, (3) implementation research, and (4) efficacy and efficiency research. Undergirding those areas is a cross-cutting set of questions that transcend individual thematic areas. Each part of the agenda's framework presents sample research questions and sub-topics. This comprehensive (but not exhaustive) research agenda will aid researchers in contributing to the maturing body of evidence on CBE.

Keywords: Competency-based education, research agenda framework, efficacy research

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A Research Agenda for Competency-Based Education

Competency-based education (CBE) is not a new or novel teaching and learning approach (Henri et al., 2017; Le et al., 2014; Nodine, 2016; Spady, 1977). Although its genesis as a formal way of structuring curriculum and learning experiences arose in the mid-to-late twentieth century in the United States, many of the individual theoretical and structural components that make up what we now call "CBE" can be traced back to the turn of the twentieth century (Specht-Boardman, 2024). But the unique challenges of the modern education ecosystem (including, but not limited to, the rising cost of education, inaccessibility for adult learners at the postsecondary level, gaps between reported and actual learning gains, persistent and severe equity gaps in education outcomes, poor documentation of acquired learning, among others challenges) have generated a renewed interest in how alternative approaches may be a possible remedy to these challenges (e.g., Cole et al., 2024). This resurgence of interest in CBE approaches in the last decade transcends all teaching and learning sectors: early childhood, K–12, postsecondary, corporate/workplace learning and development, continuing education, and military education (e.g., Levine & Patrick, 2019; Mason et al., 2021; Obama, 2013). However, as interest grows in CBE programs, and the mass adoption of CBE approaches in all education sectors continues, there is an urgent need for a coordinated research effort to produce evidence on CBE efficacy and effectiveness. The goal is not only to ensure that the outcomes of CBE programs are positive for learners but also to help illuminate which best practices in CBE are most impactful and should be replicated for future program implementation. This paper presents a novel, comprehensive, and cross-sectional research agenda to guide the next wave of research on CBE.

What is Competency-Based Education?

CBE is an outcomes-based approach to education. Although there is no formally accepted universal definition of CBE, a set of characteristics appears to be frequently indicated (e.g., Bushway et al., 2017; Evans et al., 2020; Frank et al., 2010; Gervais, 2016; KnowledgeWorks, 2023; Parsons et al., 2023; Singal et al., 2014; Spady, 1977; Specht-Boardman, 2024). Students only progress through the curriculum and ultimately earn their credentials based on their mastery of the competencies, not based on the amount of time spent on the materials (seat time) (Council of Regional Accrediting Commissions [C-RAC], 2015). Mastery is typically set at a higher level of performance than the traditional "pass." Certifying the achievement of a competency needs to represent an operational definition of mastery rather than minimal competency. And because the sole determinant of learning is the demonstration of the competencies in a performance-based, authentic manner, learners have a high degree of agency in the exact path they take to arrive at mastery, meaning that learning is typically self-directed, allowing learners to choose when they complete materials. CBE programs enable learner-pacing, rather than instructor-pacing, of the educational experience, representing a paradigm shift in the traditional relationship between

time and learning. Learner agency also means they may meaningfully build upon existing knowledge and experience as they demonstrate mastery, allowing learners to spend more time on new and challenging content and less time retreading what they have already proven they know. CBE programs emphasize the strong role of instructors and support coaches, enabling each learner's success in an individualized and differentiated manner.

Although most CBE programs ascribe to these shared characteristics, there is also an incredible breadth of individual implementation decisions and model design variations across all learning sectors. For instance, Parsons et al. (2023) identified over 50 individual design features of postsecondary CBE programs, of which *each* feature has between three and six variables to choose from, effectively meaning there are hundreds of unique combinations of ways to implement CBE. Although the underlying pedagogy of CBE remains a *relatively* consistent shared vision across different institutions and sectors, the remarkable variation of program design approaches and distinct learner experiences means, for the most part, the old idiom is true: When you have seen one CBE program, that means you have seen one CBE program.' As practitioners, this fact pattern is liberating because it means your context and learner needs can drive your design; as scholars seeking to study those programs, this fact pattern is among our field's largest and most enduring challenges.

CBE's Claim

The thousands of different individualized implementations of the CBE approach to teaching and learning across every learning sector are likewise driven by different motivations and theories of change. But again, though the words that postsecondary, K–12, workforce training, and military education sectors use may differ, there is the semblance of a shared set of value propositions for what CBE promises to achieve. These underlying traits of CBE have the potential to fundamentally move the needle on some of education's most enduring and systemic challenges. CBE programs promise to improve learning outcomes by holding all learners to higher expectations of excellence but individually supporting them on their unique pathway to attain competency. CBE's emphasis on learner agency may translate to improved flexibility, access, and completion of credentials, especially by those learners historically underserved by the prevailing approach of educational delivery. The emphasis on collaborative curriculum development across diverse and cross-sectional partners (e.g., inclusion of industry voices) results in more relevant and non-siloed programs that better connect across a learn-work ecosystem. CBE programs strive to be more efficient experiences that do not force learners to spend preordained hours on content areas, allowing teachers and learners to invest their limited time (and, in the case of postsecondary education, money). This approach to teaching and learning emphasizes the role of active, performance-based demonstrations of learning in an experiential context, helping to tie academic and non-academic settings of performance more closely and repair what is perceived to be a persistently widening gap between the expectations of employers and the abilities of graduates.

The Need for a Research Agenda

Since its early years nearly a century ago, CBE has held versions of these promises and change theories as its North Star. And that theory of change has, in equal parts, inspired both converts and critics over decades (e.g., Gallagher, 2014; Spady, 1994). In tandem with the incredible interest and resurgence of energy in modern educational reform towards CBE approaches in the last decade, on the lips of educational administrators, faculty, policymakers, funders, parents, and learners themselves remains a single blunt question: "Does CBE work?" or "What evidence is there that suggests CBE is a more effective educational approach than the status quo?" (Specht-Boardman, 2024). More specifically, evidence that indicates which features of CBE are most useful for which learners are missing. These are questions of efficacy and effectiveness, and it is the job of researchers and scholar-practitioners to answer those questions with a body of evidence.

Efficacy is defined as the extent to which an intervention works when implemented under ideal conditions (Shadish et al., 2002). Thus, efficacy research is defined by the methodology of rigorous empirical studies that permit us to attribute causality to the intervention. Effectiveness is the extent to which an intervention works when implemented under conditions of actual implementation (Shadish et al., 2002). In general, applied researchers consider effectiveness a type of efficacy study and refer to both as efficacy research. To a practitioner, using the results of an efficacy or effectiveness study is not only dependent on the rigor of the design that increases their confidence in the cause-effect relationship of the intervention to the outcomes studied; practitioners also consider the specific implementation details of crucial importance.

The differences between efficacy and effectiveness studies are highlighted in Table 1. The differences between these studies involve the research questions, the research setting, the population of the participants, the implementers, and the nature of the intervention (Singal et al., 2014). The research question for efficacy studies is addressed in ideal circumstances, whereas for effectiveness, it is done in real, live conditions as defined by the program.

The existing state of efficacy research on CBE in the United States is limited, and where it does exist in sufficient detail, it is uncoordinated and largely disparate. Now, more than ever, education researchers and scholar-practitioners interested in CBE approaches need guidance, coordination, and a shared understanding of the field's empirical needs. CBE stands on the precipice of mass adoption as more and more states, accreditors, districts, and, indeed, even whole industries (e.g., nursing, see American Association of Colleges of Nursing, 2021) turn to CBE as a path to solve their unique educational challenges. We need more research to build a strong evidence base to inform responsible program design and scaling and make the case for widespread adoption. The goal of this research agenda is to provide cross-sector guidance, coordination, and direction for researchers to begin filling in the evidence gaps on modern CBE.

The existence of this agenda does not imply there has been no research on CBE to date. In fact, quite the opposite is true: while it is only a small subset

Table 1
Differences between Efficacy and Effectiveness Studies

	Efficacy Study	Effectiveness Study
Research Question	Examines whether the intervention works under ideal circumstances	Examines whether the intervention works in real-world situations as done in practice
Setting	The study is undertaken in ideal settings controlled by the researcher	The study is done in a real setting where the program (intervention) is implemented
Population of Participants	Involves strict criteria for inclusion	Few exclusion criteria
Implementers	Trained in both the program and the research procedures	Training in research procedures with no additional training in the program/intervention
Nature of the Program/ Intervention	Strictly enforced and standardized; no concurrent interventions	Program/intervention is applied without interference or input by the researcher. Concurrent interventions may exist

Singal et al., 2014.

of the field of education research, dozens of studies have taken place in the last decade and generally had encouraging findings on the efficacy of CBE approaches (e.g., Bowman Foster & Jones, 2020; Mayeshiba et al., 2018; Navarre Cleary, 2020; Parsons et al., 2016). Several systematic reviews have arrived at neutral or encouraging findings on the status of the research basis overall for CBE, although they have noted significant gaps in the state, breath, and quality of that research (e.g., Evans et al., 2020; Henri et al., 2017; Kelly & Columbus, 2016; Specht-Boardman, 2024). The challenge is that in addition to the lack of coordination (as noted above), most of this research is single-institution, case study, and descriptive or qualitative. The research is focused mostly on CBE program design and implementation as opposed to outcomes and efficacy. Few rigorous experimental designs, like true randomized controlled trials or quasi-experiments, look at the efficacy of CBE outcomes compared to a non-CBE control. Those studies that do focus on outcomes tend to have study designs that use proxy measures—such as performance on the NCLEX, as in the case of Lipsky et al. (2019), or self-reported career outcomes in the case of Rivers and Sebesta (2017) - to compare CBE to non-CBE interventions. However, those studies often lack the study design to ensure that outcome differences are indeed a function of the use of CBE and not inherent differences in population characteristics. Additionally, in a systematic literature review of implementation and outcomes research in K–12 from 2002 to 2019, none of the outcome research studies reviewed used experimental or quasi-experimental research designs to support their claims of efficacy of CBE programs (Evans et al., 2021).

This research agenda guides the next wave of CBE research, emphasizing the need for cross-case, systematic work consistent with the evolution and maturity of

the field. Now that there are more CBE programs reaching maturity and scale, the programs in the field can support increasing rigor in research design, which may also include greater inclusion of longitudinal studies, cross-sector analyses, and multi-institution studies in addition to other forms of rigorous efficacy and effectiveness research using experimental and quasi-experimental methods. The agenda aims to help coordinate and guide disparate research efforts.

At the same time, this agenda is in and of itself a form of advocacy: we call upon the field of education researchers and scholar-practitioners to propose and conduct research in alignment with this agenda to begin to systematically answer some of the most pressing questions about CBE. As investments in all sectors continue to implement CBE programs as solutions to systematic problems, research must be followed to show the evidence of their efficacy and justify continued investment in their implementation. In addition to its use by researchers, we intend that this agenda may also be used by research funders, thought leaders, and practitioners as a tool to coalesce around.

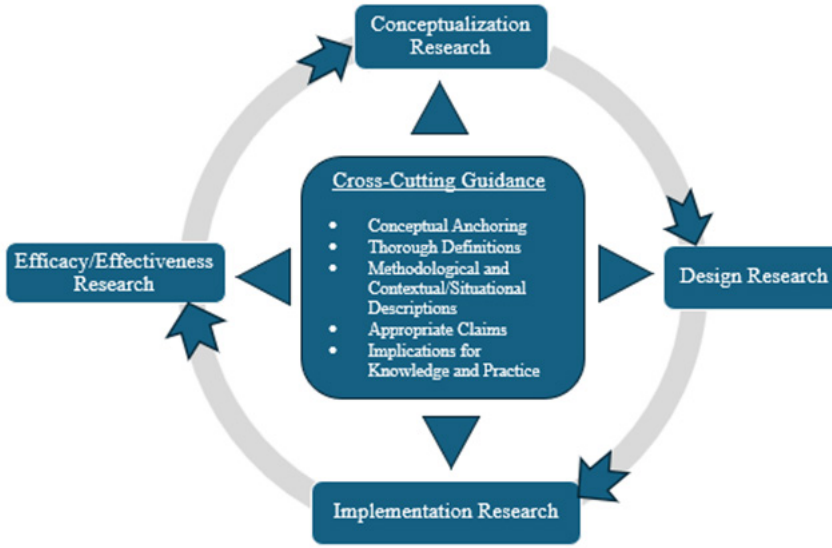
Development of the Research Agenda

This agenda results from collaborative efforts by over 40 practitioners, scholars, and thought leaders across several activities throughout 2024. Eighteen national and international CBE experts, researchers, and practitioners first met in April 2024 at the University of Kansas to address the need for rigorous efficacy research by establishing a comprehensive research agenda. Three organizations, the University of Kansas, the Competency-Based Education Network (C-BEN), and the American Institutes for Research (AIR), provided the leadership and coordination of the agenda, with the University of Kansas in particular serving as the convener and principal supporter of the efforts to produce this agenda. Throughout the three-day meeting, the group deliberated and produced the most pressing research questions that form the heart of this research agenda. The attendees (listed in full in Appendix A) represented colleges and universities, non-profit organizations, education technology, and the military. Although most represented postsecondary learning settings, there were representatives with the perspectives of the CBE field at the K–12 level. Then, a second set of experts (listed with their permission in full in Appendix B) reviewed the research agenda throughout the summer of 2024, adding research topics and providing feedback to enhance the clarity and value of the agenda. The extensive nature of the research agenda included research topics in conceptualization, design, implementation, and efficacy research. This agenda, although comprehensive, is not intended to be exhaustive or prescriptive. Its authors and reviewers agreed that they expect the agenda to evolve, along with the priorities espoused in the agenda, as more voices come into the shared ownership and execution of the collective agenda.

Use Cases of this Agenda

One of the major reasons for producing and disseminating a research agenda for CBE is to sound a call for evidence to advance the knowledge base regarding the efficacy and effectiveness of CBE (Parsons & Mason, 2021). A research agenda

Figure 1
The Components of the Research Agenda and their Relationship



articulates a research plan allowing researchers to act in implementing the research (see examples by American Institutes for Research [AIR], 2018; Institute of Education Science, 2016). Establishing the research agenda involved producing research topics, questions, and suggestions for researchers regarding the information needed to publish the research results. The research agenda offers direction, provides a pathway of action, and suggests the information needed in research reports.

The intended uses of this research agenda are (a) to encourage, if not inspire, researchers (including doctoral students) with various perspectives and voices to undertake research suggested in this fairly comprehensive research agenda on CBE, (b) to consider addressing the need for rigorous efficacy research, (c) to offer researchers suggestions for a research topic, (d) to provide ideas for researchers who want to inform a policymaker at a local, state or national level or provide guidance to an institutional or system lead practitioner, and (e) to consider adding to the growing body of knowledge and literature by disseminating research reports.

Organization & Presentation of the Agenda

The questions presented in this research agenda are organized into four research areas**:** conceptualization, design, implementation, and efficacy (see Figure 1). Organizing the research agenda into these four areas serves several purposes. First, these thematic groupings may allow for integrating and coordinating studies that explore similar topics. Second, the four areas have an interconnected relationship—as illustrated by Figure 1—whereby discoveries and insights gleaned in one area may inform and feed into the other areas. The following are brief descriptions of each

research area, presented in more detail, along with suggested research questions, in the remainder of this paper:

1. **Conceptualization Research** focuses on developing a deep and consistent field-wide understanding of the theoretical underpinnings of CBE as a pedagogical approach. Research that advances the field's understanding of the theories that drive CBE's value proposition to students adds rigor to CBE research and provides clear avenues for other research directions. Research questions in this area focus on developing, clarifying, and organizing ideas, theories, frameworks, and models that drive CBE (e.g., Hiebert et al., 2023; Scherer & Stein, 2016; Wagner, 2008).
2. **Design Research** explores how CBE curricula and competencies are designed, how those design choices vary, and how assessments are designed and used in CBE programs. Research in this area can contribute to the field's understanding of the relationship between competencies and curriculum design, curriculum design and assessment, and the experiences and outcomes of CBE learners. Research on the design of CBE is a blend of scientific investigation with the systematic development of programs (McKenney & Reeves, 2012).
3. **Implementation Research** is centered on understanding how CBE programs are implemented, with attention to the range of design features present in CBE programs, such as faculty models, tuition, cost to institutions, IT systems, and funding models. The goal of implementation research is to develop an evidence-based understanding of program implementation and how implementation decisions impact program effectiveness and quality. Additionally, it can support cross-case comparisons, helping develop common metrics and elements across varied institutional models.
4. **Efficacy and Effectiveness Research** seeks to demonstrate the potential impact of CBE programs on outcomes for learners, how those outcomes compare to outcomes for learners in traditional programs, and whether those outcomes are equitable. Although there is early evidence that CBE programs have the potential to benefit groups that traditional programs do not necessarily serve well (e.g., adult learners, and learners from low-income backgrounds), practitioners and policymakers need more rigorous evidence to inform key decisions about CBE. Research in this area should be designed with an eye toward rigorous methods that support a causal understanding of CBE's impact on learner outcomes.

Alongside these main thematic areas in the research agenda, we offer several considerations for interested researchers based on key challenges identified in the existing research on CBE. First, given the previously described variation in CBE program design, it is important for new research studies to clearly describe the program model(s) and design features that are being studied, as well as offer any context about the program(s) that might support wider interpretation of the findings. We recommend that researchers apply the language in the program model framework defined by Parsons et al. (2023) to ensure consistency in reporting program model characteristics. Because CBE programs vary considerably, this kind of information

can support other researchers in replicating studies or designing new ones in similar or different contexts. In addition, drawing on established theoretical frameworks or developing new frameworks or theories of change supports the field's development by offering common frameworks or language for understanding whether and how CBE is fulfilling its value proposition.

Beyond CBE-specific guidance, we encourage researchers to use language free of bias (American Psychological Association, 2020), adhere to ethical principles (American Educational Research Association, 2011), and include a well-described theory, model, or framework to support the research question(s), thorough specification of the CBE model and implementation as well as thorough documentation of the methods and results based on empirical traditions of the social sciences (see Duran et al., 2006). We advise researchers to use a methodology in their research that is aligned with the claims indicated by the research question. If the research question indicates cause-and-effect questions, the methodology used by the research should support these intended inferences (see Austin, 2011; Befani et al., 2007; Donmoyer, 2012; Maxwell, 2005; Rohlfing & Schneider, 2016; Rosenbaum & Rubin, 1983; Shadish et al., 2001; West & Thoemmes, 2010). In addition, we hope researchers strive to share their work with diverse audiences, including practitioners and policymakers, so we encourage sections discussing the application of any research to those audiences' work or decision-making.

The following sections delve more deeply into the research agenda's four thematic areas, offering a set of potential research questions for each. While these questions are presented here as discrete questions in a thematic category, we expect that many studies may transcend individual themes and address several discrete categories. We hope that as individuals publish scholarship aligned with this agenda, they indicate in their publication which question(s) they are aligned with and how their work advances this agenda.

The Research Agenda

I. Conceptualization Research

This category of research questions focuses on the theoretical underpinnings of CBE as a pedagogical approach. These studies provide the basis and direction for future research, including applied research using new frameworks. This section of the agenda focuses on developing, clarifying, and refining theories and frameworks relevant to CBE. These studies might engage literature in adjacent fields and can include literature reviews or other strategies. Although CBE's value proposition is commonly understood by those working in CBE programs (Parsons et al., 2023) and has informed the development of a field-accepted set of quality standards (Bushway et al., 2017), a unified theory for how CBE program design affects learner experiences and outcomes has not yet been developed. Work in this category can provide direction for further research and support CBE advocates, organizations, leaders, and others in more clearly articulating the theory of change and value proposition for CBE programs.

1. What are the value propositions of CBE for different audiences, and through what mechanisms does CBE achieve those value propositions?
2. How do learning theory, pedagogy, economics, human development, and organizational theory inform CBE program design or its theory of action?
3. What does it mean for competencies and assessments to be authentic and contextual?
4. What are the philosophical and conceptual bases for defining competencies and their assessments?
5. What is the socio-historical evolution of CBE programs, and what problems of practice are they best positioned to solve?
6. What are the external factors (e.g., policy and regulations, educational technology) influence CBE design and implementation?
7. What measurement and statistical analysis models could be used or developed to better understand CBE design, implementation, and outcomes?
8. How do different contexts and situations alter and/or influence how we evaluate the quality and efficacy of the CBE programs?
9. How are quality standards contextualized and applied to various CBE programs?
10. What is the role of learners, as well as faculty, in the conceptualization, design, and implementation of the CBE programs, the curriculum, and the assessments?

II. Design Research

This category of research questions addresses the design of curricula, competencies, and assessments as part of CBE programs. These elements are central to a CBE program model. In CBE programs, learners' demonstration of competency or mastery through assessment is the basis for progression and degree completion; therefore, clear and relevant curricula, competencies, and assessments are key to the value proposition for CBE. A range of approaches exist in the field, varying by how and when institutions developed their CBE programs, the discipline or field of study, and other factors. Research questions in this category seek to study and document the variations that exist in the design of CBE programs and the factors that motivate these designs. The research questions also would assess whether certain designs work better (and for whom and under what circumstances), the quality and relevance of these approaches, and the relationship to learners' outcomes. Studies addressing these questions are important to lay the groundwork for continued research, as well as for practitioners who are designing, adopting, or continuously improving their CBE programs.

1. What are the features that make a competency integrated and meaningful?
2. From a learning perspective, what are the features, size, and scope of a competency?
3. How can the affective domain be included in competencies, in the teaching, learning, and assessment of such competencies

4. Who should be involved in designing a CBE program? … in specifying the competencies? …in designing the CBE curriculum? … in designing the assessments?
5. What is the process of CBE curriculum design? How are decisions made regarding what competencies make up the curriculum?
6. What models of competency frameworks are currently in use; how are competency frameworks developed and deployed in curriculum design; what are the advantages/disadvantages of each model; what are the conditions and contextual factors that influence the adoption of a particular competency framework?
7. What competency-based assessments are currently being used, and what do we know about them regarding types of assessments (formative, summative), measurement properties, and validity evidence? To what extent are assessments aligned to competencies?
8. What are the types of design features for assessments in CBE? What influences these design features?
9. How are performance levels of competency/mastery established using assessments in CBE? How should cut-offs for competency-based assessment be set; which standard-setting model should be used? Are there different approaches for different CBE programs?
10. What are the design features of assessments in CBE programs? Are these features different/similar between formative and summative uses of the assessments?
11. How should performance-based assessments in CBE be designed?
12. What are the perceptions of various stakeholders (e.g., employers, learners, educators, among others) on assessments in CBE programs?
13. What are the conditions of mastery in CBE programs, and how do different scoring models (e.g., compensatory vs. conjunctive) influence the awarding of mastery scores on competencies?
14. What evidence exists from other established fields (e.g., learning experience design, instructional technology, user-centered design) that intersect with, reinforce, and/or inform the design of CBE learning experiences?

III. Implementation Research

This category of research questions addresses the implementation process and design choices by institutions as they develop and adopt CBE programs. Initial work suggests that CBE programs vary widely in design choices, such as faculty models, pricing models, technology systems, student support structures, and other elements (Parsons et al., 2023), but we know relatively little about why. We also know relatively little about how these implementation choices shape, or are shaped by, the experiences of those involved, such as learners, faculty, and administrators. Research questions in this category might include the change leadership or change management processes and conditions motivating or enabling CBE adoption, design choices about the programs, and the relationship between adoption processes, design choic-

es, and students' experiences. This work may take many forms, including descriptive, conceptual, and other approaches. Studies addressing these questions are of particular interest to practitioners and institutional leaders interested in exploring CBE as a possibility on their campus, as well as those actively designing, re-designing, or continuously improving their CBE programs. This work might also inform state agencies or state system offices interested in supporting and enabling the implementation of the CBE program at their institutions. This research may, for example, refer to logic models and theories of action or may use methods such as implementation science (e.g., Andres & Nordengren, 2022; Fixsen et al., 2019; Frechtling, 2007).

1. What are the conditions for successful CBE implementation of the following sample variables and factors[1]? What factors enable/limit the implementation? How do the individual factors and the interactions of the factors influence implementation success? What are the common barriers and facilitators related to these factors?
2. What implementation strategies resonate with institutional and broader-level (local area, system, state, national) decision-makers, policymakers, and influencers?
3. How are technological innovations enabling or supporting (maybe creating barriers to) CBE implementation?

Example questions are as follows:

- What is the user feedback when innovative assessment technologies are used?
- How can AI be used in program support?
- What are various ways innovations in online or technology-supported instruction can be implemented? Does the implementation method vary by new versus more mature programs?
- What technological innovations align with a pedagogical approach to personalized learning?
- What role does technology play (e.g., applications, mobile devices, online tools, among other technologies) in facilitating the implementation of CBE?
- What are the potential unintended consequences of the use of certain technological innovations?

4. What are the key implementation decisions for CBE programs, and how do institutions decide on those implementation approaches? See Parsons et al. (2023) for a framework.

[1] The list of selected factors for use in implementation research includes the delivery model, student population, staffing/faculty model, pedagogical strategies, funding/financial model, technology supports, who and types of roles of those involved in the design and implementation of CBE, types of professional learning about various topics (e.g., CBE, online teaching, coaching, assessments, assessment tools, technology tools, etc.), existence and types of wrap-around supports, use and type of use of AI-assisted supports, change management models, and types and extent of leadership and governance.

5. How are institutions implementing strategies that best facilitate student progression throughout the learning lifecycle (recruitment, support, retention, and graduation) in CBE programs?

IV. Efficacy and Effectiveness Research

This category of research questions addresses the efficacy of CBE programs, particularly focused on learners' outcomes in terms of learning, degree completion, goal attainment, employment/wages, and other outcomes. This work may be descriptive or causal in nature, with a core goal of understanding the CBE program's causal effects on learner outcomes compared to outcomes for similar learners in traditional programs–and whether those outcomes are equitable. Ideally, rigorous methods might include randomized controlled trials or quasi-experimental designs such as difference-in-differences. CBE—and indeed, education research more broadly—presents challenges for rigorous causal studies, which is why this agenda includes a category of questions that may scaffold questions and issues for the field. These questions are crucial for policymakers, institutional leaders, and accreditors who may dedicate or enable resources to flow to CBE programs. In addition, studies that assess whether certain CBE program designs are more effective for learners in general or certain sets of learners can inform institutional practitioners as they seek to design CBE programs that fit the populations they seek to serve. If studies in this category inspire improved and refined adoption of CBE programs by institutions, learners may be the ultimate beneficiaries.

1. What are the short- and long-term outcomes[2] of CBE programs?
2. How do specific factors[3] of CBE programs and their interactions affect outcomes?
3. How do the outcomes of CBE programs vary by learner characteristics[4]?
4. How do the outcomes of CBE programs vary by the interaction of learner characteristics and program design choices?

[2] Some selected outcomes include learner learning gains and cognitive development, career and employment outcomes, employability, labor market impact (e.g., wage gains, employment related to learning, career mobility, career flexibility, career development/progression, meeting employer//employment/employee needs, lifetime earnings), program progression metrics (these can be conventional metrics or alternative ones as applicable to CBE programs), community engagement, development/strength, swirling (jumping around institutions), civic participation, personal outcomes (Attitude, moral/character development, personal goal achievement, personal satisfaction, increased education outcomes for family members, and institutional outcomes (e.g. ROI, enrollment/revenue, employer satisfaction with graduates).

[3] Some selected factors include online/on-campus, direct assessment vs. course/credit, unbundled/bundled faculty model, subscription or unit pricing, pedagogical factors associated with mastery learning such as mastery of all competencies and multiple attempts at each assessment.

[4] Some selected learner characteristics include socio-economic status, geographic location, gender, race/ethnicity, age, learner motivations, learner concurrent employment, home responsibilities (e.g., parent, elder care, etc.), learner control of time, primary language, experience in education, and personal goals. Additionally, the interaction effects of pedagogical approach and learner characteristics.

5. How, and under what conditions[5], do learner outcomes vary based on differences in educational setting and design?
6. How do completers of CBE programs vs. traditional programs perform on standard assessments?
7. How do the outcomes of CBE programs compare to the perceptions and expectations of CBE programs by learners, faculty, employers, and other groups?
8. How do supervisors rate the on-the-job performance of graduates with CBE vs. non-CBE training? How do these ratings differ among employers in different settings (e.g., military, types of industries, non-profit organizations, and other types)? Do supervisor ratings differ between situations where the CBE training occurred while the individual was already employed vs. before employment?
9. What is the impact of CBE on educational systems (e.g., organization, finance, definition of academic year, among other aspects) and practices (e.g., credit for prior learning, prior learning assessment, and other types)[6]?
10. How and when do agencies and employers use or partner with CBE programs? What do they report as their motivations/value propositions?

Conclusion

We provide this comprehensive research agenda to assist researchers in their work in contributing to the body of knowledge of CBE. Together, these topics and example questions suggest key questions relevant to the field and can inform practice and policy decisions. As the field of CBE continues to grow, a robust research base must be formed to inform best practices in the design and implementation of CBE programs. At this stage in developing a unified research base for CBE, any study that advances any one of these questions is welcome. Methodological and contextual diversity of studies is both expected and essential to ensure that the field analyzes CBE from an array of perspectives. One of the important goals of the full agenda is to enable increasingly rigorous research as the field matures, with an ultimate emphasis on learner outcomes, given the centrality of that to the value proposition for CBE.

We also expect this research agenda will generate input from the communities of researchers and practitioners to refine it, permitting this document to evolve. As noted earlier, this is not intended to be an exhaustive list of research questions. While this is a wide-ranging research agenda, it is merely a starting point for the next phase of CBE research. Researchers will have other research topics and questions to address specific purposes and examine CBE creatively and from various perspectives. Given that education research findings are traditionally dispersed across scores of journals, it is commonly challenging for a clear, unified response to an agenda

[5] Some of the possible conditions include institutional type, program area/discipline, rolling enrollment vs. traditional start/end dates, type of credential, education setting PK-12/HED/Military/Corporate, country/region context, regulatory environment, culture for change, etc.

[6] See the following for sample commentaries about the impact of CBE: Gruppen et al. (2012), Spady (1978), Spady & Mitchell (1979); Williams (2012).

to be easily understood. The publication of this agenda coincides with the launch of the new *Competency-Based Education Research Journal*, which will serve as a new clearinghouse for research on CBE. We invite journal submissions in adjacent areas and welcome revisions to the research agenda, which will inform us of future updates. We expect revisions/updates to the research agenda to be produced and disseminated through the *Competency-Based Education Research Journal* based on findings from scholarship and suggestions from scholars and scholar-practitioners.

Competency-based education has incredible potential to address many of our enduring educational challenges. As innovation and advancements in program design and implementation continue to occur, robust empirical evidence must be generated to inform program design and report on CBE efficacy. Public policymakers, funders, employers, faculty, and learners are eager for evidence on CBE, and this research agenda is intended to help guide the field in answering the most pressing questions posed by those various groups.

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Appendix A

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Appendix B

List of Reviewers of the Competency-Based Education Research Agenda

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