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AI-Driven Content Organization for Competency-Based Applied College Programs: A Proposed Framework

Abbas H. El-Gamal [a, b]

[a] Department of Basic Education, College of Education, Qassim University, Buraydah 51452, Saudi Arabia
[b] Customer Service program, Applied College, Qassim University, Buraydah 51452, Saudi Arabia

A B S T R A C T :

The implementation of competency-based education (CBE) has grown and gained traction in the field of higher education due to the appeal of improved employment alignment and clear outcomes in the educational learning (Kouwenhoven, 2010). In the case of applied colleges where the achievement of student employment outcomes is an educational goal, the structuring of the curriculum content around particular competencies becomes essential (QAA, 2025). However, research shows that even where the institution has adopted a CBE the curriculum design of content in applied programs is still largely structured in a content and time format and this hinders the applied realization of CBE. Simultaneously, the job market has of late been more geared towards skills based hiring through digital big data and AI (Ciriaci et al., 2023). While AI is leveraged in higher education in learning analytics and performance (ERIC, 2024), the use of AI in organizing curriculum content has still been insignificant. This work seeks to suggest a conceptual framework that combines CBE curriculum structuring in applied colleges and the use of AI for competencies in the labor market. The descriptive-analytical method utilized in the framework shows that market data can inform systematic content sequencing, alignment, and continual curriculum updates (Castañeda et al., 2024).

Keywords: competency-based education, applied colleges, AI analytics, curriculum organization, labor market alignment

Introduction

Kouwenhoven (2010) and Knowledge Works (2025) note that schools are beginning to adopt models that embrace Competency Based Education (CBE) due to the increased focus on learning and the competencies graduates should demonstrate, as opposed to the antiquated model of focusing on time spent in classroom learning. There has since been a shift in both K-12 and higher education to embrace CBE as an educational model. Applied colleges, however, occupy a unique and strategic niche in the education sector, as their mandate is to train graduates to seamlessly transition into the workforce for specific technical and occupational positions (Shift iQ, 2025). As a result, this necessitates that educational programs in such colleges focus on the development of explicitly defined and measurable competencies, as opposed to the traditional discipline and content-centered approaches to course development (EBSCO Research Starters, 2017; Kouwenhoven, 2010).

Competence frameworks alone, as reflected in the literature, pose little meaning to the real issue of implementation. Rather, the real challenge lies in the articulation of specific competencies and the alignment of these competencies with the curriculum, pathways, instruction, and evaluation (Kouwenhoven, 2010; University of Hull, n.d.). The desired instructional outcomes of competencies demand purposeful instructional design choices as to what and how content will be organized and delivered throughout the modules and how evaluative techniques will be structured to ensure there is progressively deepening competency throughout the offered programs. For applied colleges, competency-based content organization is a fundamental driver of the curriculum and is fundamental to course design, pathways, and assessment in the entire program (QAA, 2025; Shift iQ, 2025).

While the recent levels of policy and accreditation competencies and cometency-based education integration has been advanced, applied colleges seem to face structural challenges in trying to organize curriculums to reflect the stated competencies. Current literature suggests that even if competencies are documented, the content of the teaching, the pathways and the assessments are still foundationally traditional and organized in an unlinked way. This disconnection suggests it may be an issue of an institution as a whole, rather than simply a lack of educational professionalism and methodology.

At the same time, global labor markets are undergoing a significant change where the emphasis for recruitment, particularly in technology driven areas, has shifted to skills and competency based evaluations (Ciriaci et al., 2023). The rapid development in technology also modifies the required competencies. This, in turn, places more emphasis on applied colleges to ensure that there is continuous alignment of programs to the labor market needs, not just periodic and historic alignment of curricula.

The State of the Art in Artificial Intelligence (AI) and large-scale data analytics have unlocked unprecedented abilities in Evidence- (and) Intelligence in Education (Fadel et al., 2020). The fields of Learning Analytics, Educational Data Mining, and the Natural Language Processing of various Knowledge Engineering Techniques have enabled the intelligent analytical processing of data to guide Instructional Design, the adaptation of Assessment Strategies, and Curricular choices (ERIC, 2024; Sciencedirect, 2024). The growing understanding of AI as more than a 'tool' for Predictive Modeling and Personalization, but as a mechanism for Structural Instructional and Content reconfiguration, is transformative (Fadel et al., 2020).

The most significant of contemporary Learning Analytics involves the synthesis of data beyond learner attributes encapsulated in the academic institution. The aggregation and, in real time, the identification, classification, and the longitudinal tracking of competencies described as Intelligence in the Labor

Market, mined from online job advertisements, occupational frameworks, as well as National and International Skills Reports, provide to applied programs timely data that go beyond insights to transform plans of study, which data-driven, expert-analytical procedures often lack (Alharthi & Alqahtani, 2022; Castañeda et al., 2024; ScitePress, 2025).However, most of the uses of AI in higher education today centered around student performance analytics, such as adaptive learning, early warning systems, and predictive analytics. The more holistic embedding of AI-based analytics in the organizational structuring of curriculum and content is still rudimentary. The absence of integrated, cohesive, and specialized competencies frameworks, dynamically and contextually informed by the relevant labor market, is one of the most significant gaps in the literature, particularly in the context of applied college education.

This paradox presents a conundrum for applied colleges. On the one hand, they must figure out how AI-informed analytics can shape content sequence and structure in meaningful competency frameworks. On the other hand, they must deal with the ever-changing competencies in demand, driven by the labor market. The current work is intended to address this dual problem by offering a conceptual tool for structuring content in applied college programs within a framework of competencies, enhanced with AI and labor market analytics.

The previous discussion clearly points out the existence and significance of the problem of absence of synchronized interrelations between competency frameworks, curriculum structuring, and the labor market. Although applied colleges have embraced CBE in a programmatic and policy fashion, evidence points to a lack of organizational mechanisms. This lack of alignment is the foundation of the problem this research is seeking to address.

1.2 Research Issue

Competency-Bed Education (CBE) , given institutional endorsements, has been introduced at applied colleges, yet continues to experience foundational structural discrepancies between approved competencies, and the actual arrangement of curriculum, content, and assessment practices. This disconnect limits the genuine realization of CBE and lessens applied programs' responsiveness to the changes in the workforce.

This is exacerbated by the increasing skills- and competency-based hiring in the labor market which demands more and more ongoing and systematic changes to the curriculum (Ciriaci et al., 2023; World Economic Forum, 2023). Particularly applied colleges are in need of rapid updating of content structures, in order to keep pace with the changing socio-technical landscape. This is a widespread challenge, and is not limited to applied education contexts.

In spite of the significant progress in the capabilities of AI, its application in higher education remains largely confined to the optimization of the learning process. Predictive analytics, personalized learning systems, and early alert systems are widely available, but models of AI that can inform the selection of content, its sequencing, and alignment with the competencies are alarmingly absent from the literature.

Consequently, there are no existing integrated-AI supported competency-analysis models, which align labor-market intelligence with the structuring of the curriculum and content within applied programs. This limitation stands as a significant gap within the research, especially in terms of informing decisions related to the inclusion of content, the sequencing of competencies, and the alignment of assessments in CBE applied programs at the college level. This gap is the primary aim of the current research.

1.3 Primary Research Inquiry

What conceptual framework has been proposed in the literature regarding the structuring of content in applied colleges within a competency-based education model that uses AI-powered competency analytics from the labor market?

To elaborate on this inquiry, the following sub-questions have been developed:

1. What are the main difficulties for applied colleges on structuring the content of their programs?
2. What labor market data sources are most relevant for the AI-based extraction of competencies in applied programs?
3. What are the possible uses of artificial intelligence and data analytics in the identification, classification, and tracking of competencies within the labor market?
4. To what extent can the analytics of competencies generated by AI influence the decisions of what content should be included, the order of content, and how the content should be connected in the programs of applied colleges?
5. What are the most important elements and design features of an AI-based, competency-focused framework for organizing content in applied colleges?

1.4 Research Delimitations

Thematic delimitation: The study examines the potential content structuring for post-secondary programs in a CBE framework and, more specifically, the structuring of content in programs augmented by AI-driven labor market analytics. The framework will be developed conceptually and, will not be deployed empirically, nor evaluated at the program level.

Time delimitation: The analysis will be based on literature published from 2018 to 2025 with emphasis on the most recent literature regarding CBE, AI, and learning analytics.

Geographical Limitations: The present analysis focuses on Saudi higher education, specifically on the case of applied colleges, while some relevant international models are analyzed in a comparative and conceptual manner (SDAIA, 2023; Ministry of Education–Saudi Arabia, 2022).

1.5 Purpose of the Research

Contribution to Theory: This study advances scholarship in CBE by offering an integrative conceptual framework for applied program structures and AI-driven competency analytics in the context of the curriculum theorizing debate on the CBE framework spontaneity curriculum.

Contribution to Practice: The suggested model offers a framework that can assist applied college administrators and curriculum designers in the strategic overhaul of program curriculum content to suit changing demands in the job market. For instance, an IT program in Saudi Arabia can leverage the model to pinpoint and align program curriculum modules to job-advertised AI competencies at a national and regional level.
Contribution to Method: The research illustrates the utility of integrative-analytical and conceptual model methods in research on curriculum design and organization, and offers them as a precedent for other design research in higher education.

1.6 Research Objectives:

1. To examine the use of AI and data analytics in identifying and organizing competencies in the labor market (Objective 2 focuses on Sub Question 2 and 3).
2. To create an AI-based model for the organization of qualifications for content structure in applied colleges (Objective 3 refers to Sub Question 5).
3. To understand the integration of competency frameworks and content organization models with AI-powered competency analytics and the structure of inputs-processes-outputs (Objective 4 refers to Sub Question 4).
4. To determine the factors for implementation and the gaps in the adoption of the proposed framework in applied colleges (Objective 5 refers to Sub Question 5).

These objectives facilitate the construction of the descriptive-analytical framework, which will be explained in the following sections..

Theoretical Framework of Research

Within the post-secondary education system, competency-based education serves as an organizational model that develops a curriculum around measurable, demonstrable learniing, as opposed to traditional deficit models that focus on content, instruction, and time. In colleges and universities that deliver curriculum designed for occupational/technical education, this perspective views competencies as the key focal point from which to organize the curriculum, structure the sequence of instruction, and align the assessments.
ab Initio design studies have shown that competency-based education can also provide a flexible framework for organizing educational material. Rather than structuring learning material in a discipline-based sequence, CBE emphasizes a more cross-disciplinary approach, where learning material can be organized at the specific competencies level required at the instructional design stage. Rather than organizing material in a sequential manner based on topics, lectures, or clock time, CBE emphasizes the purposeful arrangement of learning activities, instructional resources, and assessments measuring the same competencies. This form of alignment in educational design is known to be particularly critical in applied colleges. CBE frameworks are expected to have a close alignment with curriculum competencies which are also expected to be transparent and directly relevant to the workforce prepare and employability outcomes, to learning outcomes, and for education accreditation bodies. (EBSCO Research Starters, 2017, Shift iQ, 2025, QAA, 2025)
Since they focus on preparing students for careers, applied colleges are a bit different from other colleges in higher education. They use applied learning with industry integration to build curriculum (ARI & University of Notre Dame, 2025). So, in applied colleges education is aimed at preparing students for the workforce and building skills for specific jobs rather than substantive theory. This focus has led to the introduction of short-cycle and modular programs, work-integrated learning, and experiential education to address urgent labor market challenges. (European Commission JRC, 2024; Saudi Academic Framework for AI Qualifications, 2023). In this context the success of applied programs is measured in terms of students competencies and employability (Ciriaci et al., 2023).
Under a CBE model, the component of organization becomes the most important, albeit the most neglected, aspect of curriculum design. Traditional programs structure their content thematically or in terms of discipline, whereas CBE needs the knowledge, skills, and tasks to be organized in terms of which ones contribute to the development of a particular competency (Kouwenhoven, 2010). Competency-based content organization consists of determining a curriculum's foundational and advanced competencies, designing a taxonomy of learning experiences for horizontal and vertical integration across modules, and aligning appropriate assessments with the learning activities. For applied colleges, the development of curricula on topics to competencies is a particularly complex challenge, as they must consider the integration of institutional design, accreditation, and labor market needs (Teaching and Learning Centre, 2023).
These problems with the curriculum are compounded by the changes taking place in the labor market. There is an increasing body of empirical evidence regarding the emergence of skill- and competency-based hiring practices. Credentialism is becoming an increasingly weaker indicator of labor market employability (Ciriaci et al., 2023). In technological and AI-intensive areas, rapid changes in innovation lead to changes in desired competencies, causing static curricula to become obsolete (ARI & University of Notre Dame, 2025). Therefore, the content of applied college programmes needs to be flexible and adaptable to allow for the frequent addition and alignment of new competencies (European Commission JRC, 2024). CBE addresses this problem by basing curricula on clearly defined and mutable competencies as opposed to static, content-based subject frameworks (Castañeda et al., 2024).
At the same time, AI and analytics in data have shifted in the focus of attention in the domain of higher education. The primary focus of the collaborations of AI with education—adaptive learning, automated feedback, predictive analytics, and intelligent tutoring—has been the improvement of educational outcomes and student performance (Fadel et al., 2020; ERIC, 2024). Learning analytics is the study of data generated from student interactions, assessments, and engagement in order to inform teaching and learning. However, given the sophistication of these systems, there is still an emphasis in most AI educational applications on early warning systems and personalized learning, with little evidence of more comprehensive, strategic use in curriculum and program design (ScienceDirect, 2024; ScitePress, 2025).
Recent advancements in AI and industrial analytics have begun to scrape and analyze vast datasets from the external labor market to inform competency frameworks and labor market analytics. Aggregated and updated datasets including job market postings, competency frameworks, and skill and occupation profilers reflect real-time market demand from employers (Castañeda et al., 2024). Natural Language Processing and data mining studies though in their infancy showcase the data mining and skill competency demand over time clustering AI capacities (Alharthi & Alqahtani, 2022; ScitePress,

2025). AI data driven techniques compared to conventional advisory board evaluations and employer surveys have greater scalability, timeliness, and sensitivity to the data (Castañeda et al., 2024; ARI & University of Notre Dame, 2025).

The incorporation of artificial intelligence into competency analytics alongside CBE-region content organization is a relevant yet underdeveloped domain of research. Labor market analytics can help determine which competencies warrant focus, the organization of learning activities, and the design of differentiated learning pathways for specific occupations (Alharthi & Alqahtani, 2022; Castañeda et al., 2024). However, the current use of AI in post-secondary education is rarely coupled with redesigning the entire curriculum of a program in a competency-based manner (ERIC, 2024; Paradiso Solutions, 2025). Some AI-influenced teaching, learning, assessment and adaptive learning frameworks focus on teaching; others focus on content reclam and reorganization; however, there is a scant body of work on reorganization through additive, subtractive, or transformative merging processes for curriculum elements based on competency data analysis (Jantakun, Jantakun, & Jantakoon, 2024; Kennedy & Gupta, 2025).

It would be best to further characterize both the proposed framework's scope and nature at this stage. As conceptual and procedural, this framework aims to assist applied colleges in developing their curricula. This does not advocate for any one curriculum model. Instead, it lays out a sufficient arrangement for the consideration of labor market analytics, competency and content structuring, and adaptable design curriculum. The intended application is to curricula of applied colleges, where responsiveness to competency aligned and workforce needs is crucial.

To facilitate understanding of this integration, the framework is complemented conceptually by a proposed diagrammatic representation (Conceptual Framework Diagram). The visual model offers the understanding of the paradigm of interrelationship whereby AI-driven labor market analytics, competency identification and structuring, and curriculum content organization and sequencing coexist within a CBE context. The diagram is not included here, but the surrounding text of the framework provides the theory and the sequence of steps the representation would include.

2.2 Summary of Prior Research

The adoption of a competency-based approach within higher education has been recognized within academic literature as a way to increase transparency, enhance employability, and allow for greater integration of education with workplace demands (Pichette et al., 2018; Lassnigg, 2015). Although much of the literature has been adopting the CBE framework, research, and evidence show that a number of institutions continue with conventional course outlines and thus have little integration of the competencies with the actual learning (Kouwenhoven, 2010; PNPI, 2023).

Given the focus of literature on vocational and applied higher education, partnerships with industry, modularization, and the focus on the development of practical skills have been viewed as key differentiators (OECD, 2021; Ciriaci et al., 2023). Unfortunately, there is a complete lack of institutional responsiveness and adaptive curriculum frameworks that would allow for the rapid incorporation of newer/changed desired skills (O'Kane, 2024; Escudero & Riepl, 2024).

The literature in CBE has framed the organization of content around the learners and competencies as a core principle in the alignment of learning resources, learning activities, and assessment (Pichette et al., 2018; Lassnigg, 2015). Still, many programs continue to organize content around disciplinary topics, and as such, the gaps between intended and achieved competencies continue to expand, with applied colleges suffering the most from this issue.

OECD (2021) and Ciriaci et al (2023) consider the changes in the labor market and the increased importance of skills-based recruitment. This is detected in the Zawacki-Richter et al (2019) and Picciano (2025) works focusing on the increased importance of AI and data analytics in education. The labor market AI analysis Castañeda et al (2024) has high forecasting ability; However, curriculum data integration is lacking.

2.3 Research Gap and Rationale

The reviewed literature indicate a consistent gap regarding the intersection between competency-based education, curriculum content organization in applied colleges, and the use of AI-driven competency analytics. While published studies address these domains independently, there is still a lack of Integration across these studies to inform strategically CBE curriculum sequencing and content organization decision making in applied programs as CBE is increasingly institutionally adopted and AI is increasingly used in labor market analysis (Jantakun et al., 2024; IRMA International, 2025).

The gap is more pronounced for applied colleges which have to navigate qualification frameworks by level within a country, domestic and international institutional tensions, and a constantly changing set of industry needs and resource (European Commission JRC, 2024; SAUDI ACADEMIC FRAMEWORK FOR AI QUALIFICATIONS 2023). The absence of procedural models that integrate labor market analytics, competence frameworks, and content structuring prevents institutions from fully harnessing the opportunities AI presents in curriculum design. Hence, the present research focuses on addressing this gap by offering a coherent conceptual–procedural model for specified contexts within applied higher education.

2.4 Provisional Steps for the Implementation of the Proposed Framework

The proposed framework stems from a chain of interrelated procedural actions aimed at safeguarding theoretical soundness, practical relevance to the labor market, and applicability in an applied college.

Step 1: Analytical Assessment of Relevant Literature

An analytical assessment was carried out across multiple key areas that included the following: competency-based education (CBE), applied and professional education, content structuring (and its organization) in CBE, transformations in the labor market, AI and analytics in education, and AI-based competency analytics. This phase was critical in isolating core definitional elements and research gaps that are available.

Step 2: The Identification of Necessary Components for the Implementation of CBE in Colleges

This stage examined both the programmatic and institutional aspects, including the nature of the applied programs, the country and institution's competencies, and the guiding principles for the sequencings and assessment of content within a CBE framework.

Step 3: The Search for Market Information Related to Competencies

To assist in the extraction and validation of competencies, relevant sources of information in the labor market were identified: job offers, professional standards, skills frameworks, and descriptions of occupations.

Step 4: The Development of Mechanisms for Competency Analytics Using Artificial Intelligence

This step described the application of artificial intelligence, particularly in the form of natural language processing, to the extraction, classification, synthesis, and comparison of competencies, and the identification of discrepancies between educational outcomes and the needs of the labor market.

Step 5: The Integration of Competency Analytics with the Structuring of Content

The results of the analyses were interweaved with educational design, particularly in terms of competencies to be prioritized, the mapping of competencies to specific learning outcomes, the sequencing of content, and the alignment of the proposed content with the assessment design.

Step 6: The Development of the Initial Conceptual Model

An integrated model was constructed to demonstrate the interrelationship between labor market analytics, the frameworks of competencies, the organization of content and the application of artificial intelligence to provide support for the iterative change of the curriculum.

Step 7: Validation Against Literature and Reference Frameworks

The Draft framework underwent validation processes regarding its alignment with the tested and emerging principles of CBE and the program design specifications and trends in AI in Education.

Step 8: Design for Use and Continuous Improvement

In the end, the framework was designed for versatility in the fields of study, for iterative adaptations in line with the evolving labor market, and for enhancements through more sophisticated forms of AI.

Research Methodology

The approach to the proposed conceptual model structured within a competency-based education framework augmented by AI analytics might best be described as descriptive-analytical with a constructive orientation integrating aspects of design-based research (DBR) or research and development (R&D). The intent of the research is not to simply describe or analyze the phenomenon, but rather to develop a proposed conceptual model to address the organization of content for applied colleges.

3.1 Justification for the Selected Methodology:

The nature of the research provided the rationale for adopting this specific methodology, as developing a conceptual model is the goal of this study rather than testing hypotheses and/or working within the realm of quantitative data. The nature of the phenomenon being studied and the focus of this research on the development of a conceptual model, and the descriptive-analytical approach will allow the researcher to integrate and synthesize the body of educational and technical literature, analyze pertinent documents and develop a model that is comprehensive and relates to and bridges theory, labor market needs, and the applied colleges environment.

3.2 Scope of the Study:

Thematic scope: The study is limited to the organization of applied college programs by educational content and the competencies to be mastered, leaving the program implementation and/or evaluation of the program out of the scope of this study.

Time scope: The study will utilize current literature and studies designed within the time frame (2018-2025) that analyze recent innovations with regards to AI and Data Analytics.

Geographical scope: The study is limited to applied colleges within the Saudi higher education system and takes into consideration international counterparts.

3.3 Research Methods:

Analytical assessment of documents (for example: program plans for colleges, frameworks of competencies, documents pertaining to market labor).

Review of Literature (studies available in the past, frameworks of theories, models that are applied).

Modeling of Concepts (a model that is integrated and is to be built, displaying a conceptual model that brings together the components and the relations of the model in question).

3.4 The Method Used To Build, And Theoretically Validate The Model Proposed:

A model, the one proposed, was formed through a set of steps that are connected to one another, starting with the reviewing of literature and subsequent analysis of documents, to step two where requirements for competency in education are identified, to step three where data of the labor market is determined, then step four where AI mechanisms analytical for competencies are specified, to step five that is where analytics for competencies is linked to the content of the program organization, to step six the model is built, then step seven where the model is peer-reviewed with past research and frameworks of reference, and then step eight where the model is presented in a form that is usable and flexible.

Theoretical validation occurred through a peer review of the model in question with existing literature. This was designed to establish that the model incorporates all the necessary components, such as the fundamental principles of competency-based education, and the requirements linked to applied programs and the trends that are contemporary in AI used in education.

3.5 The Proposed Framework

Within this segment, the focal point of the study is delineating the advanced analytical architecture for the structuring of applied higher education curriculum within the CBE paradigm and enhanced with AI analytical tools. The goal of the framework is to offer a preliminary integrated model that synchronizes the portability of competencies, the structure of educational resources, and the configurations of the education system for the continual updating of educational resources.

3.6 Detailed Explanation of the Analytical Framework:

The analytical framework adopts a tri-partite model of design that encapsulates input, processing, output, where each segment of the model employs AI as a design and analytical framework to ensure the model retains a capacity for flexibility in responsiveness to either the immediate or mediate dynamics within the labor ecosystem.

3.5.1 Elements of the Framework:

- **Inputs**: Comprise of labor market elements, including but not limited to employment opportunities, professional architectures, skills frameworks, and role specifications. AI methodologies such as NLP and data mining methods in the extraction of the required competencies across the different domain areas and sectors are employed to evaluate and analyze the data (Castañeda et al., 2024; OECD, 2021).
- **Processes**: Competencies are extracted, analyzed, and classified, and then prioritized and linked to certain educational modules and activities. The AI establishes the content's logical and psychological order and creates adaptable learning paths that integrate various competencies (Jantakun et al., 2024; Kennedy & Gupta, 2025).
- **Outputs**: These are micro-credentials, adaptable and dynamic curricula, and flexible learning paths that respond to the ever-changing demands of the labor market. These outputs are periodically updated in accordance with the AI analysis of the labor market (ScitePress, 2025; Zawacki-Richter et al., 2019).

3.5.2 The role of AI at each stage has been divided evenly as follows:

Input stage: The extraction of competencies from the labor market data has been delegated to

AI. Process stage: Competencies are analyzed and classified, priorities are assigned, and adaptable learning pathways are created with the assistance of AI.

Output stage: The micro-credentials and curricula that are dynamic and adaptable are created and periodically updated through the use of AI.

3.5.3 Data Flow Mechanism from Labor Market to Content Organization :

The flow begins when labor-market data is collected followed by analyzing it through artificial intelligence to learn what competencies are needed. These competencies are grouped and associated to specific educational units and learning activities to be created and put into customizable learning pathways. These learning pathways are modified using AI analytics of labor-market data.

3.5.4 Relationship of the Model to CBE Frameworks:

The proposed model strengthens the principles of competency-based education by educational content being targeted to competencies within the labor-market. The model incorporation of educational units and activities to specific competencies enhances the degree of the education-work alignment.

3.5.6Clarification of Continuous Update Dynamics (Feedback Loops) :

The proposed model is designed with layers of feedback loops while competencies and learning pathways are modified and updated periodically by AI analyzing labor-market data. As a result, the educational programs are up to date and synchronized with the demands of the labor-market.

Results, Discussion, and Interpretation

This study culminates in an integrated conceptual framework. The results are not empirical. Instead, they demonstrate the integration of theories, labor market data, and the CBE design model into a unified framework that provides the foundations for the flexible placement of content within applied programs.

4.1 Rationale for Choosing the Methodology

The nature and purpose of this study is to develop (not theorize) and describe a conceptual model; therefore, this approach to research is the best choice. The purpose of the descriptive-analytical approach to the study is to allow the researcher to synthesize educational/technical literature and documents. Then conduct analyses to allow the researcher to create an integrated model of the educational theory, the context, and the elements of the informal job market and the operational environment of applied colleges to be interconnected.

Research Boundaries: Thematic Boundaries: The study is limited to the organization of content in applied college competency-based programs. The study does not address program implementation or program evaluation.

Temporal Boundaries: The study is based on recent literature and studies (2018-2025) focusing on recent advancements in AI and analytics.

Geographical Boundaries: The study is on applied colleges within the Saudi higher education system and takes into account overseas applied colleges.

4.2 Research Instruments:

This involves the scrutiny of particular documents like college program descriptions, competencies frameworks, occupational market studies, etc.
This involves the preparation of advanced reviews of documents, theoretical investigations, and practical model studies.
This will involve the preparation of an integrated conceptual construction portraying the proposed model components and the relationships among them.
Method of Constructing and Theoretically Validating the Proposed Model:
The model is relevant to CBE and contemporary AI in education. This is in the discussion show the integrated framework and its shortcomings and provides a formal way to stitch labor market insights and curriculum design.
Theoretical validation of the model consists of a review of literature for the model and validation of core ideas around curriculum models, principles of competences, the major components of program design, and contemporary innovations in educational Artificial Intelligence.

4.3 Practical Implications:

The proposed model is applicable to the end goal of programming professional college courses to the ongoing changes in the labor market. The model can deal with flexible content and rapid modifications in applied specializations such as Information Technology, Business Administration, Engineering, and Health areas.

4.4 Institutional requirements to utilize the model:

Availability of technical infrastructure that has the ability to support data analysis and integration of AI tools. Specialized teams with a combination of expertise in curriculum design, data analysis, and development of educational programs. Intensive cooperation between applied colleges and experts from professional disciplines and the labor market.
Responsibilities of the representatives of the educational institution, the planners of the curriculum and the experts in data as follows:
Educational institution representatives: Acceptance of the model and the provision of the required support and resources in the institution.
Curriculum planners: The use of AI analytical tools to reflect on the organization of content and the design of courses at the curricular level.
Data specialists: Facilitating the capture and analysis of data from the labor market and the continuous maintenance of the competency matrix.
Imagine an applied college with an information technology program. Suppose there is information about international and local job adds that gets collected and analyzed with AI tools to determine the job requirements. The job requirements are technical, professional, and behavioral and matched with respective related educational units and learning tasks. The educational designers align the tasks so that students develop from rudimentary to sophisticated abilities, and incorporate flexible pathways attuned to the demands of the market. The information content is modified regularly using AI so that educational programs are synchronized with the labor market.

4.5 Recommendations:

1. Educational institutions must implement adaptive organizational structures to competency-based content and integrate AI systems that assess labor-market information to update the competencies to be taught on a regular basis.
2. Educational institutions should devote some resources to facilitate the work of multidisciplinary professional teams that integrate expertise from curriculum design, data analytics, and education program development.
3. The partnership with professional domains should be strengthened to ensure program outcomes do not deviate from the real market needs.
4. Curriculum developers should utilize AI labor market analytics to ascertain the competencies that need to be taught and associate them with relevant instructional units and activities.
5. Flexibility in learning pathways should be designed to accommodate the logical and psychological sequencing of the content, which can be moved along from simple to complex skills.
6. Curricula and learning activities should be updated periodically based on the AI labor market data analytics.
7. Competency-based organizational frameworks in applied colleges can be promoted by educational policymakers through the provision of institutional and legislative incentives.
8. Policies that facilitate the provision of the technical infrastructure needed for data analytics, and AI to be integrated into the curricular planning processes should be developed.
9. Educational institutions should be able to promote partnerships with professional domains in order to maintain the alignment of educational programs with labor-market demands.

4.6 Future Research Recommendations:

1. Investigate the impact on quality and workforce alignment of the potential AI-based competency-bundled content organization framework in varied contexts through implemented studies.
2. Improve the effectiveness and efficiency of labor market competency in analytics through advanced AI methods and technologies.
3. Proposed model integration with assessment and academic accreditation in applied colleges.
4. Assess the potential of the model's application in other applied areas such as engineering, business, health and information technologies.
5. Assess dynamically updated AI-enabled curricula on graduate employability and the reputation of institutions.

6. Support educators in the practical application of the content organization framework with the creation and application of effective tools or software.
7. Expose the cultures and institutions influenced by the AI based Shift in Competency Curriculum Design
8. Assess the use of AI and advanced data analytics in decision making and content collaboration in education to inform the ethical boundaries as well as privacy concerns involved in such systems.

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