

Supplementary File

Author(s)	Description	Strengths	Weaknesses	Opportunities	Threats
Brandon, et al. [21]	Analysis of constructivism and active learning principles to CBC development	Learners construct new ideas or concepts based upon their current or past knowledge, active learners Student centered, interactive, and innovative curricula	Constructivist model is based on rigorous academic standards and expectations Students must be active participants in a collaborative environment	Students are taught concepts rather than large amounts of content-laden material Constructivism can be easily integrated into nursing education in the clinical setting	Not addressed
Getha-Eby, T., et al. [3]	Relationship between concept-based teaching, meaningful learning, and knowledge transfer Constructivist principles and meaningful learning	Meaningful learning has the potential to improve nursing students' understanding of unfamiliar patient situations Learners must have understanding of concepts, engaged in the learning process Discipline-specific concept-based teaching, and active learning strategies allow conceptual knowledge transfer from classroom to clinic Active learning techniques stimulate learners to make meaningful connections between pre-existing and new knowledge	Students do not always make connections to preexisting knowledge in an accurate manner Erroneous connections during integrative reconciliation	Knowledge provides a context for understanding concepts Explicit teaching consists of strategies that draw attention to connections Higher order thinking of data interpretation, differentiation of relevant from irrelevant data, and generation of hypotheses to account for observations	Clinical activities must be concept-based, rather than exemplar-based Cognitive engagement
Giddens, J., et al. [17]	Benchmark approach to validate and finalize concept selection	Concept-based curricula reflect contemporary literature and practice trends in health care	Not addressed	Endless possibilities exist for concepts to be considered for inclusion in concept-based nursing curriculum	Not addressed
Giddens, J., et al. [8]	Curriculum reform Innovative, web-based teaching platform Professional nursing concepts = 23 Health and illness concepts = 36	Health; illness; and professional nursing concepts. Exemplars based on state, national, and global health incidence and prevalence statistics for population groups throughout lifespan or of importance within practice	Students link concepts from didactic to clinical practice settings Minimize emphasis on content	Curriculum revision: clinical experiences driven by concept-based learning, focus on experiences across population groups and practice settings Advantages: content is de-emphasized, fosters critical thinking A variety of learning activities and assignments are explored, including simulation learning and concept-focused experiences	Duplication of content creates drain on faculty resources Develop clinical judgment from understanding of patient care on a conceptual level It may take several semesters before problems are accurately identified and fully understood
Giddens, J., et al. [12]	BSN (New Mexico statewide) Pre-licensure BSN in community college settings Shared curriculum for ADN and RN to BSN	Competency-based curricula, shared statewide or regional curriculum Need for preparing graduates with advanced skills in thinking, application, and information management	Not addressed	Mechanisms for transparency and communication Students educated in their communities	Measurement of graduate nursing education success
Giddens, J. et al. [4]	Factors contributing to content saturation	Emphasizes concepts across the environmental settings, the life span, and the health-illness continuum	Faculty members protect content associated with their own clinical expertise Students learn how to organize information in logical mental structures	Initial concepts or concept groups should be validated through review of nursing literature Requires active learner-centered approach	Content saturation and content repetition within and between courses Positive course evaluations and high pass rates on the NCLEX® strengthen resistance to change

Table 1: Developing Concept-based Curriculum by Author, Description, Strengths, Weaknesses, Opportunities, and Threats.

Legend: ADN = Associate Degree in Nursing; BSN = Bachelor of Science in Nursing; CBC = Concept-based Curriculum; CCNE = Commission on Collegiate Nursing Education; DECs = Differentiated Essential Competencies of Graduates of Texas Nursing Programs; MSN = Master of Science in Nursing; QSEN = Quality and Safety Education for Nurses; NCLEX = National Council Licensure Examination; RN = Registered Nurse

Author(s)	Description	Strengths	Weaknesses	Opportunities	Threats
Gold, C., et al. [16]	Conceptual framework	Conceptual frameworks clarify areas of responsibility and identify actions Organizing significant knowledge	Not addressed	Subject to periodic reassessment and revision	Nursing process as a conceptual framework should be avoided because it is a method of thinking
Brandon, et al. [21]	ADN to BSN progression	Addresses the challenge of content overload	Consistent new information in nursing curriculum; no decrease in current knowledge base required	Biophysical processes allow the nurse to manage patients with any condition or disease that involves an aberration in these processes Eight psychosocial concepts prepare nurses to manage holistic aspects of patient care Six concepts relate to professionalism Nine concepts relate to health care system	Not addressed
Hardin, P., et al. [10]	Semiotic framework for teaching conceptually Outlines core components: addressing misconceptions, developing enduring understandings, and acquiring metacognitive skills	Focus on active and learner-centered teaching techniques does not equate to learning conceptually Concepts vary on level of abstraction from general to specific Correct student misconceptions as concepts are introduced, unfreeze concepts from static understandings, and provide the best links to learn new and old concepts	Current teaching no longer communicates concepts and skill sets required to prepare practitioners for health care	Teaching conceptually entails focusing on how meaning is produced and used Constructivist pedagogy When concepts are understood, understandings will transfer across educational and clinical contexts Metacognition accompanies the learning process. Students transfer knowledge from one context to another	Clinical activities must be concept-based, rather than exemplar-based Cognitive engagement
Heims, M., et al. [15]	Compares traditional curriculum to CBC	Advantages: flexibility, focus on learning, efficacy of use of clinical time Students observe, pose multiple answers to patient problems and test ideas without endangering client There is limited discussion of variety when the student takes care of one or two patients with too little focus on the process of learning about nursing care	Traditional patient assignments students busy with patient care - focus is on the worker role and performing accurately and safely	Clinical experience should encourage testing and experimentation while fostering creativity	Not addressed
Lee, S., et al. [23]	Need and the development of model courses for Texas	Strategies were developed to meet IOM goal of 80/20 by 2020 Framework included 3 strategies: expand direct BSN production, increase concurrent ADN/BSN enrollment, and expand current RN to BSN programs and add new ones Texas Concepts Health and Alterations Benefits of CBC: reasonable content volume, Concepts build on clinical complexity. Students transfer learning to new situations Course templates available for ADN, RN to BSN, and MSN programs	Faculty develop unfolding progressive case studies Most nursing textbooks based on traditional systems model Students are accustomed to memorizing and reciting Fear that students donot get all that they need NCLEX* pass rates: 30% increase with CBC, 42% no change, 5% lower pass rates	Concepts provide a range of information Curriculum matrix to crosswalk the outcomes with CCNE Essentials, DEC's, and QSEN Students identify and critique2 strengths and 2 areas for growth	Difficult to transition from content intensive curricula Faculty leave rather than transition

Table 1: Continued...

Author(s)	Description	Strengths	Weaknesses	Opportunities	Threats
Dailey, J. [6]	Transition to CBC	Deliberate reduction in content Learner-centered pedagogy teaches students the discovery of knowledge, identification of interconnected patterns, and recognition of key characteristics. Faculty guide learning CBC is rewarding, job satisfaction	Transition takes planning and effort Must be ready to commit personnel and resources into the change CBC adds responsibility and work	More in-depth guidance to students Faculty focused on the most prevalent conditions found in health care	Faculty support content-laden curriculum
Deane, W., et al. [26]	Overview of CBC and key issues for faculty to consider Bridges' model of change Transitioning from traditional pedagogies to CBC	Constructivist learning theory 3 phases for identifying strategies to transition to CBC Higher order thinking, clinically relevant health care scenarios. educator is facilitator of learning	Not addressed	Meaningful learning is integrated with previous knowledge and experience to understand concepts Students formulate the big picture and not memorize Students make cognitive connections from theory to practice	No current evidence of relationship between CBC to NCLEX* pass rates
Decker, K., et al. [13]	Constructivist approach-encourages learners to actively participate in their learning Integrates community health concepts throughout the curriculum, framed within the social determinants of health: Conceptual education is a prominent movement in nursing and in many other disciplines 4 specific culture of care areas: sexual well-being, mental health, alcohol and drug awareness, and respect	Concepts can be used for creating unified principles, or classifications, which organize learning while bolstering understanding	Not addressed	Not addressed	Not addressed
Forbes, M., et al. [22]	Concepts that should be threaded: diversity, EBP, quality care and patient safety, critical thinking, clinical reasoning, clinical judgment	Not addressed	The traditional model remains in the majority of BSN programs	Nursing education programs need to re-evaluate and revise current educational practices	Faculty resistance, difficulty reaching consensus about essential curricular content, inadequate focus on the process of student learning outcomes, limited numbers of faculty with expertise in education
Giddens, J. [35]	Conceptual approach-conceptual teaching, conceptual learning, conceptual thinking	Deliberate focus on the definition and the attributes, the patterns of recognition, and the role of the nurse Empowers learners	Challenges include changes in teaching practices, empowering learners, and assessing learning	Purposely teach the concept, and develop integrative learning opportunities that require students to apply the concept in the context of patient care settings	Faculty must commit to developing new teaching approaches for classroom and clinical education
Nielsen, A., et al. [29]	Not addressed	Not addressed	Use of commercial vendors skew entry-level knowledge gained	New mechanisms needed to validate entry-level competence	Not addressed

Table 2: Implementing Concept-based Curriculum by Author, Description, Strengths, Weaknesses, Opportunities, and Threats.

Legend: ADN = Associate Degree in Nursing; BSN = Bachelor of Science in Nursing; CBC = Concept-based Curriculum; EBP = Evidence-based Practice; NCLEX = National Council Licensure Examination; RN = Registered Nurse; VN = Vocational Nurse; PN = Practical Nurse

Author(s)	Description	Strengths	Weaknesses	Opportunities	Threats
Patterson, L., et al. [11]	BSN (Georgia) Describes evolution of CBC, curriculum assessment after implementation	Faculty development workshop prior to implementation Concepts were leveled and threaded throughout the curriculum using a "Concept Grid" NCLEX® pass rates remained consistent (91%), students overall satisfaction remained consistent, (87%-97% agreeing or strongly agreeing), aggregate student scores related to critical thinking skills trended upward, faculty engaged with curriculum	Faculty identified issues with how and when concepts were taught Faculty did not understand the concepts and exemplars	Curriculum groups improved communication and identified changes from formative evaluations Faculty were able to identify and correct curricular issues that impeded student learning	Changes to assigned course faculty could threaten "Concept Grid" implementation
Sportsman, S. [9]	348 responses, 27% adopters, 73% non-adopters. Of the 73% non-adopters, 34% were in process of developing CBC. 52% had either implemented CBC or plan to Respondents from ADN, BSN, VN/PN Sixty percent (60%) of the respondents in programs reporting implementation of a CBC had graduated at least one student cohort	Nurses think conceptually Goal of nursing education is to prepare students to think and practice conceptually	There is little documentation regarding the number of nursing programs currently implementing CBC or the effectiveness of CBC programs	Examine concepts applicable to nursing, recognize the similarities and differences, and apply in clinical situations	Not addressed
Sportsman, S. [27]	Theory of Innovation used to implement CBC: Education, persuasion, decision-making, implementation, confirmation Includes tool for self-assessment of teaching-learning style	Evaluation of effectiveness of CBC	Faculty must prepare students for change in curriculum	During orientation, discuss conceptual learning, conceptual practice, and the reasons for the change	Not addressed

Table 2: Continued...

Author(s), Program Outcomes	Description	Strengths	Weaknesses	Opportunities	Threats
Duncan, K., et al. [33] Program outcome metrics: licensure pass rates, graduation rates, national assessment of critical thinking, program satisfaction, and student self-efficacy Few outcome differences between the two curricula	Compared outcomes of a traditional curriculum (TC) to a CBC N= 240 students (n=104 for TC, n=136 for CBC)	Deliberate reduction in content Learner-centered pedagogy teaches students the discovery of knowledge, identification of interconnected patterns, and recognition of key characteristics. Faculty guide learning CBC is rewarding, job satisfaction	Education strategies reported to foster self-efficacy include problem-based learning, student engagement activities, and feedback	More in-depth guidance to students Faculty focused on the most prevalent conditions found in health care	Faculty support content-laden curriculum
Elliott, A. [30] Evaluated overall student learning related to professional values The qualitative methodology of framework analysis was used to evaluate written assignments	Evaluation of student learning (N=75)	An appreciation for professional values	Not addressed	Not addressed	Not addressed
Giddens, J., et al. [32] Two years of qualitative and quantitative data collection, data saturation, Program metrics: national standards and NCLEX pass rate Reduction in curricular content load	Curriculum evaluation in BSN education CBC didactic and clinical Pre-licensure BSN, (New Mexico)	Surveys and focus groups identified strengths of curriculum Conceptual foundation: emphasis on lifespan, health and illness; care delivery	Perceived repetition of content; need for greater age-span, pharmacology, and pathophysiology content and NCLEX®-RN preparation	Unique approach to clinical education: all clinical courses link to didactic curricular concepts Allowed for student input Three benchmarking surveys compared to national data	Unexpected changes confound evaluation (e.g., leadership change, length of courses)
Gooder, V., et al. [25] Combination of qualitative and quantitative methods were used to measure curriculum revision impact on students	Mixed-method study, student surveys (N= 95) Evaluated by individual surveys and student focus groups.	Emphasis on organization and delivery rather than curriculum design	Dissatisfiers: redundancy, newness, and teacher characteristics	Intuition is part of problem-solving, analytical besides intuitive, experts need implicit and explicit knowledge	Not addressed
Hendricks, S., et al. [24] Significant culture shift: CBC explores understanding relationships versus memorizing facts Program evaluation strategies and barriers to CBC implementation across the United States	Not addressed	Active learning strategies allow students to organize and apply essential thinking structures to nursing situations Students compare and contrast exemplars	Faculty not prepared in curriculum development, instructional design, and active learning strategies Faculty concern about program outcomes	Concept mapping, task analysis, transparency in lesson organization, and comparing/contrasting activities to achieve results Active learning - learning from mistakes in the low-risk settings of the class-room and lab Barriers: roles of faculty and students, organization of curriculum, and what students need as essential knowledge, skills, and attitudes	Decreased lecture and increased active learning are inherent to CBC
Higgins, B., et al. [28] Evaluation of concept analysis diagram that transposes theory to practice and concepts to patient care	Concept analysis diagram was created for each curriculum concept Fosters conceptual thinking	Provides correlation and interrelatedness of concepts encouraging higher level thinking Theory reinforces practice and reinforces patient-centered care Faculty adopt conceptual teaching methods Purposeful teaching of concept and deliberate focus on definition and attributes, patterns of recognition and role of nurse	Not addressed	Concept analysis diagram used to introduce students to concepts. Also used in post conference to show patient variation	Not addressed

Table 3. Evaluating Concept-based Curriculum by Author, Program Outcomes, Description, Strengths, Weaknesses, Opportunities, and Threats

Legend: BSN = Bachelor of Science in Nursing; CBC = Concept-based Curriculum; MSN = Master of Science in Nursing; NCLEX = National Council Licensure Examination; TC = traditional curriculum

Author(s), Program Outcomes	Description	Strengths	Weaknesses	Opportunities	Threats
Kantor, S. [5] Used Know-Be-Do tool to describe shift from traditional didactic and content-driven instructional method to a student-centered concept-based approach	Know-Be-Do tool was developed Curricular changes in BSN program Concept-based curriculum	Emphasis on primary health care, population health, research, evidence-informed practice, and interdisciplinary collaboration Mind map framework	Students' learning consists of regurgitation of information they believe their instructor is seeking Over-riding sense of instructor accountability to provide students with all available information has driven content saturation	Shift to community, population and global health, chronic disease management, and health promotion, provided stimulus for nurse educators to reexamine curricula	Content-driven curriculum focused primarily on medical diagnoses and lab results
Lasater, K., et al. [34] Evaluated concept-based learning on development of clinical judgment in BSNs	Quantitative data using a univariate analysis (N=28) A focus group qualitative data (N=5)	Concept-based learning activities address the theory-to-practice gap 4 phases of Tanner's Clinical Judgment Model Concept-based learning activities guide students' clinical thinking	This was a small sampling with high attrition	Not addressed	Not addressed
Lewis, L. S. [20] Program outcomes measured on 3 cohorts pre- and post-CBC implementation: NCLEX®, retention, graduation rate, and student and program satisfaction rates Program completion rates improved significantly (4.0%)	Curricular CBC Diploma (North Carolina) 14 concepts with exemplars Intent of study was to demonstrate effectiveness of CBC	Retention and on-time graduation; employer, student satisfaction; NCLEX® pass rates were unchanged Developed by entire faculty through a collaborative process that involved repeatedly examining program content and categorizing, discussing until consensus was reached	Limited evidence to support CBC implementation Lack of scientific evidence or information about the effectiveness of CBC	Implement teaching/ learning innovations Evaluation of curricular change using measures already being collected Content saturation needs to be addressed Hypothesis was that CBC would support improved retention and on-time graduation, while not affecting other program outcomes	Faculty advising committee may be confounding Program outcomes that had negative changes: student end-of-program satisfaction and alumni satisfaction
Murray, S., et al. [19] Comparative curriculum evaluation: program completion rates rose slightly following implementation Findings suggest the curriculum change had a neutral to positive impact	Comprehensive 14 foundational concepts evaluation process, pre-licensure nursing curriculum, and the tool for documentation	4 semester-long courses Developed a concept-based matrix Developed a Curriculum Evaluation Checklist	Traditional curriculum: fundamentals, medical/ surgical, psychology, and maternal/child Challenge was the time required to complete the comprehensive initial evaluation	Faculty acknowledged need to plan ongoing, comprehensive curriculum evaluation to ensure positive program outcomes	Majority of program outcomes did not demonstrate statistically significant differences between data from three student cohorts in previous curriculum and that of the first three cohorts in the CBC
Nielsen, A. [31] Used Tanner's clinical judgment model Clinical judgment rubric: measured aspects of clinical judgment	Clinical CBC in BSN education program Students learned 1 concept per day Multiple case study research Three groups observed in hospital setting, one group in long-term care setting N=39 students Age 20 to 50 years 4 MSN-prepared educators had 2-5 or more years of experience	No total patient care responsibilities Concept-specific preparation, assigned patient, collect data, perform focused physical exam. Shift the focus to clinically situated learning and pedagogies of integration Use knowledge to make decisions or influence subsequent thinking Connected theory, practice, and clinical judgment	Total patient care model of clinical education drives task-focused care Little discussion of complexities of care and subtle changes in patient condition, resulting in limited connections of clinical experiences to didactic learning	Allowed collaborative learning Educators support students in assessments, help students understand relationships between findings, and make connections between ideas, promoting the transfer of learning. Time for educator-student interaction	Student lack of engagement and preconference preparation Significant student downtime during the clinical day, educator time is spent monitoring patient assignments, and communication is focused on med admin, lab values, and time management, rather than on understanding the full picture of care

Table 3: Continued...