



Using document analysis to identify core concepts for dietetics: The first step in promoting conceptual learning

Tweedie, Judith; Palermo, Claire; Wright, Hattie H; et.al.

<https://research.usc.edu.au/esploro/outputs/journalArticle/Using-document-analysis-to-identify-core/99450948602621/filesAndLinks?index=0>

Tweedie, J., Palermo, C., Wright, H. H., & Pelly, F. (2020). Using document analysis to identify core concepts for dietetics: The first step in promoting conceptual learning. *Nursing & Health Sciences*, 22, 675–684.

<https://doi.org/10.1111/nhs.12712>

Document Type: Accepted Version

Link to Published Version: <https://doi.org/10.1111/nhs.12712>

UniSC Research Bank: <https://research.usc.edu.au>

research-repository@usc.edu.au

Copyright (c) 2020. This is the peer reviewed version of the following article: Tweedie, J, Palermo, C, Wright, HH, Pelly, FE. Using document analysis to identify core concepts for dietetics: The first step in promoting conceptual learning. *Nurs Health Sci*. 2020; 22: 675– 684. <https://doi.org/10.1111/nhs.12712>, which has been published in final form at <https://doi.org/10.1111/nhs.12712>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.

Downloaded On 2024/05/06 23:31:57 +1000

Manuscript category: Original research related to education

Short title: Using document analysis to identify core concepts for dietetics: The first step in promoting conceptual learning

Running title: Concepts in dietetics

Order of authorship and affiliations:

Judy TWEEDIE¹, Claire PALERMO^{2,3}, Hattie, H. WRIGHT¹ and Fiona E. PELLY¹

1. School of Health and Sport Sciences, University of the Sunshine Coast, Sippy Downs, Queensland, 4558, Australia
2. Department of Nutrition and Dietetics, Monash University, Clayton, Victoria, 3800, Australia
3. Monash Centre for Scholarship in Health Education, Monash University, Clayton, Victoria, 3800, Australia

Corresponding author: Address correspondence to:

Judith TWEEDIE, GradDipDiet, GradCertHighEd, APD

School of Health and Sport Sciences

University of the Sunshine Coast,

Locked Bag 4, Maroochydore DC, Queensland, 4558, Australia

Email: jtweedie@usc.edu.au

ORCID Id: 0000-0002-7089-0745

All Authors contact details

Judith TWEEDIE, GradDipDiet, APD

Lecturer and Doctoral candidate

School of Health and Sport Sciences

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/nhs.12712.

University of the Sunshine Coast,
Sippy Downs, Queensland, 4558, Australia

Tel: +61 7 5456 5849

Fax: +61 7 5459 4880

Email: jtweedie@usc.edu.au

Fiona E. PELLY, PhD, APD

Professor and Discipline Leader Nutrition and Dietetics

School of Health and Sport Sciences

University of the Sunshine Coast

Ph: +61 7 5430 2898

Fax: +61 7 5459 4880

Email: fpelly@usc.edu.au

Claire PALERMO, PhD, AdvAPD

Associate Professor

Department of Nutrition and Dietetics & Deputy Director Monash Centre for
Scholarship in Health Education

Monash University,

Clayton, Victoria, Australia 3800

Tel: +61 3 9902 4263

Fax: +61 3 9902 4278

Email: Claire.Palermo@monash.edu

Hattie H WRIGHT, PhD, APD

Senior lecturer

School of Health and Sport Sciences

University of the Sunshine Coast,
Sippy Downs, Queensland, 4558, Australia

Tel: +61 7 5459 4775

Fax: +61 7 5459 4880

Email: hwright@usc.edu.au

Conflict of interest statement

No conflict has been declared by the authors.

Source of Funding Statement

No funding sources.

Authorship statement

All authors listed meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors and all authors are in agreement with the manuscript.

Abstract

Concept-based approaches to curriculum design have been proposed in nursing and health sciences education to address the issue of content overload in curricula but have not been described in dietetics. This study aimed to identify core concepts for the dietetics discipline in Australia and investigate the commonality and differences in these concepts across different dietetic organizations across the world. This study used document analysis of a purposive sample of international dietetics competency or proficiency standards identified from English speaking dietetic organizations worldwide. Content analysis was applied to the performance criteria or equivalent from ten documents (nine organizations) to identify the most common elements. A total of 1007 statements were analyzed. Fifty-six concepts were developed. The four most frequent concepts coded across all statements were 'critical thinking,' 'communication,' 'nutrition and dietetic service' and 'quality assurance and improvement.' There were 55 concepts common to all standards. The concept of 'food security' was not present in one of the standards from the United States. The concepts that emerged from this study were common across different English-speaking dietetic organizations across the world. Small differences on the emphasis of concepts, between different competency standards may reflect the health needs; health, political, economic, and social systems; and the cultural context of a country. Identifying core concepts in dietetics is the first step to help to inform curriculum design, which may address overcrowded curricular and promote conceptual learning.

Keywords: competency standards; concept-based curriculum; core concepts; dietetics; dietetics education; document analysis

Introduction

Dietitians are professionals who apply the science of food and nutrition to promote health, prevent and treat disease to optimize the health of individuals, groups, communities, and populations (International Confederation of Dietetic Associations [ICDA], 2014). Accreditation standards for dietetics education programs across the world, require curricula to meet the foundational knowledge, skills, and attributes needed for dietetic practice but vary in the specified learning content to be included in the curricula. Requirements of these standards may differ due to the specific conditions of the dietetic organizations in the context of the country's education and health systems and the cultural, social and historical experiences of the country. Specified learning content can range from requirements for foundational bioscience and food and nutrition science courses (Dietitians Association of Australia [DAA], 2017; Dietitians Board New Zealand [DBNZ], 2018), provision of a list of specific topics ranging from between 30 (Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics [ACEND], 2016) to over 100 items (Partnership for Dietetic Education and Practice [PDEP], 2013; British Dietetic Association [BDA], 2013), or embedding specific knowledge content within competency standards for dietetic practice (Health Professions Council of South Africa & Professional Board for Dietetics and Nutrition [HPCSA & PBDN], 2017). For example, in Australia, current accreditation standards (DAA, 2017) stipulate dietetics education programs include equivalent full-time student load (EFTSL) requirements for chemistry, biochemistry, human biology, physiology and food and nutrition science courses, and curricula and assessment strategies that align with the national competency standards. Although the

provision of specific lists of topics is not intended to be prescriptive, the imperative to meet standards can add content to an already content-laden curriculum. Also adding to dietetics curricula is the competing demand to include content on new and emerging areas of dietetic practice such as environmental sustainability (Tagtow et al., 2014) and nutritional genomics (Camp & Trujillo, 2014)

In 2003, the Institute of Medicine (IOM) proposed that healthcare professionals could no longer assume that they can practice effectively using the training received in their undergraduate education, as human memory could no longer continue to retain the whole knowledge-base on effective healthcare and was becoming increasingly unreliable in keeping pace with the ever-expanding healthcare research (Institute of Medicine [IOM], 2003, pp.33). The IOM recommended that for health professionals to meet the needs of the 21st – century health setting education reform was needed, however they recognized an “overly crowded curricula” as a challenge (IOM, 2003, pp.38). More recently, a report on the future of the university sector in Australia identified curricular needed to mirror requirements of the professional world and highlighted the need for universities to innovate and transform to meet the future need of learners (Ernst & Young, 2018). Also, dietetic organizations in the United States (Kicklighter et al., 2017) and the United Kingdom (Hickson, Child, & Collinson, 2018) have recognized that dietetics needs to evolve to be adaptable, work in new emerging areas of practice, and demonstrate critical thinking skills to deal with increasing medical complexity and an aging population.

Solving content overload in the nursing education curriculum has been a driver for curriculum reform in some nursing faculties in the United States (Brussow, Roberts Scaruto, Sommer & Mills, 2019) and New Zealand (McGrath, 2015). With the demand for health professional education to reform to meet the pace of change occurring in healthcare, globalization, and rapid advancements in health technology, there is a need for innovative approaches to guide curriculum to develop dietitians to meet the emerging health priorities of future populations (Palermo, 2017).

1.1 Literature Review

The traditional approach to health professional education results in curricula overloaded with content and superficial coverage of many areas, leading to a lack of deep understanding and critical thinking (Giddens & Brady, 2007). Erikson, Lanning, and French (2017) refer to traditional approaches to education as two-dimensional, where the focus is only on content such as the facts (knowledge) and skills (processes) of a discipline. These authors suggest that the curriculum should be three-dimensional, structured around concepts instead of content, to promote deeper levels of understanding that students can transfer to new situations (Erikson et al., 2017).

Concepts are mental constructs of one or two-word nouns, or short phrases that are timeless, universal, abstract and exhibit a higher level of abstraction than content topics and have examples that share common attributes (Erickson et al., 2017; Rowland, Smith, Gillam, & Wright, 2011). Concepts are derived from the knowledge and processes defined by a discipline (Erickson et al., 2017), and both describe and

construct behaviors and meanings (Hardin & Richardson, 2012). As the cognitive construction of knowledge develops from childhood through to adulthood, the critical attributes of a concept are initially acquired through direct experiences leading to concept formation and then new concepts are acquired more frequently through the process of concept assimilation, thus contributing to meaningful learning (Ausubel, 2000, pp.88). Meaningful learning, which emerges from the constructivist paradigm, is described by Ausubel (2000) as the acquisition of new meaning through a process of the learner integrating new knowledge in a nonarbitrary, substantive way, that is related to what the learner already knows, in contrast to rote learning, in which the learner incorporates new knowledge arbitrarily into cognitive structure (Ausubel, 2000, pp.67-68). Meaningful learning in health professional education has been characterized as an active-building process, a long-standing transformation, and the development of knowledge and skills through experience (Cadorin, Bagnasco, Rocco & Sasso, 2014).

The above suggests that a deeper understanding of concepts is thought to help promote critical thinking, clinical reasoning and clinical judgment in nursing students (Giddens & Brady, 2007; McGrath, 2015), as concepts are transferred to new situations and can be applied more effectively than memorized facts (Giddens & Brady, 2007; Hardin & Richardson, 2012). A concept-based curriculum design typically utilizes concepts and exemplars to organize learning content into a conceptual framework, and student-centered education strategies to promote conceptual learning. Exemplars contextualize the concept and help students understand how the concepts apply in practice (Hendricks & Wangerin, 2017). In curriculum designed for health professional education, exemplars are based on incidence and prevalence of health problems within populations,

or those of professional significance, and are relevant across the lifespan and within any context (Giddens, Wright & Gray, 2012). A concept-based curricular design also requires active student-centered teaching and learning strategies to promote a deeper level of understanding in students through the use of higher-order cognitive thinking to organize content into concepts, thus developing critical thinking skills (Hardin & Richardson, 2012; Erickson et al., 2017).

The process for developing a concept-based curriculum starts with an identification of the core (foundational) concepts of the discipline and their definitions (Giddens & Brady, 2007), followed by the development of exemplars that best illustrate the concept (Brady et al., 2008). Core concepts can be identified through brainstorming from expert committees, surveying academics, benchmarking, or thematic analysis of topics and themes in existing curricular. There are challenges with this approach as there can be inconsistency in the distinction between a concept and content (Rowland et al., 2011) and in the range of concepts included in concept-based curriculums between different academic programs (Giddens, Wright, & Gray, 2012). Concepts can also be generated from either the facts and topics (knowledge) or the skills and strategies (process) defined by the discipline (Erickson et al., 2017). Bristol and Rosati (2013) propose using the competency standards of a profession to identify discipline concepts. While competency standards are known to be context specific, they directly guide curricular of education programs (Gonzci, 1999).

To the authors' knowledge, core concepts in dietetics have not been identified.

Identifying the core concepts in dietetics will help to inform curriculum design, which

may address the overcrowded curricular, promote conceptual learning, and improve the preparation of the workforce. Using concepts to gain an understanding of the commonality of competency or proficiency standards of different countries that guide the dietetics curriculum could establish a shared understanding of dietetics education internationally.

1.2 Study aims

This study aimed to identify core concepts for dietetics in Australia and investigate the commonality and differences in these concepts across different dietetic organizations across the world.

2.0 METHODS

2.1 Study design

A qualitative approach using document analysis of competency standards was used to identify core concepts for the dietetics discipline. Document analysis is a recognized research method for collecting, reviewing, and analyzing the written text from documents, as a primary source of research data, to examine and interpret data that are organized into major themes (Bowen, 2009). The process of document analysis involves finding, selecting, appraising, and synthesizing data within documents to answer the research questions (Bowen, 2009).

2.2 Document selection

A purposive sample of dietetic competency or professional standards (referred to standards from here on) from international dietetic organizations were selected. Using competency standards of a profession has been proposed as the first step in concept development as they directly guide curricular (Bristol & Rosati, 2013). Also, competency standards were chosen for analysis, as learning based on them can be holistic in that they describe a set of knowledge, skills, values, and attitude attributes in developing the successful performance of a discipline (Gonczi, 1999). A direct search of known English speaking worldwide dietetic organizations was conducted between the 26 February to the 7 March 2018, to search for published competency or proficiency or education or accreditation standards that are used to guide curriculum of dietetics education programs. Documents were obtained directly from an organization's website or if not available from the organization, then from their government regulating body that published the document. In addition, the ICDA and the European Federation of the Association of Dietetics (EFAD) websites were searched for direct weblinks to the dietetic organizations not already searched. For member organizations of both ICDA (including the dietetic organizations of Australia, Republic of Ireland, the United States, the United Kingdom, New Zealand and the Republic of south Africa) and EFAD whose websites were not written in English, Google Translate was used to search for standards on these websites. Selected standards, along with relevant guidance documents, were downloaded.

2.3 Data analysis

The document analysis process used in this study was guided by the document analysis process of Bowen (2009) to analyze data. Briefly, the Australian standards (DAA, 2015) were read in a first-pass review by the first author to identify what data to select to answer the following research question: "to achieve competence, what underlying knowledge would a dietetic student be required to demonstrate?" This was followed by a more focused re-reading of the Australian standards and coding of the knowledge, skills, attitudes, and behaviors to develop concepts and a draft coding framework (Bowen, 2009). The Australian standards were analyzed first due to the authors' familiarity with these standards and because dietetics preparation in Australia is broad in terms of preparing dietitians to work in multiple areas and contexts (e.g., patient care, food service, public health nutrition), unlike other countries which focus on one key area (e.g., patient care). Concepts were developed by the first author using definitions from the literature and online dictionaries, that best represented the underlying knowledge and aligned with the definition of a concept as a one- to two-word noun or phrase (Rowland et al., 2011; Hendricks, Taylor, Walker & Welch, 2016; Erickson et al., 2017). For example, for the statement "Uses client-centred counselling skills to negotiate and facilitate nutrition, behaviour and lifestyle change and empower clients with self-management skills" (DAA, 2015) the concepts coded included 'communication,' 'health behavior,' 'nutrition and dietetic service,' 'nutrition education' and 'patient-client centered.' These concepts were then reviewed and discussed by the research team, after which one section of these same standards was independently cross coded, outcomes compared, and consensus gained by all authors. The first author then tested the applicability of the coding framework by applying it to the same Australian

standards and then refined it to prevent duplication and reword concepts where relevant (Fereday & Muir-Cochrane, 2006).

A content analysis was conducted to investigate the commonality and differences in concepts across standards from different dietetic organizations across the world. Performance criteria or equivalent were selected for analysis except for the standards from Canada (PDEP, 2013) and the Republic of South Africa (HPCSA & PBDN, 2017). For the latter, competency and outcome statements were analyzed as their performance criteria were presented as learning outcomes, which may overinflate the coding of concepts.

In the first step of data analysis, the concepts of the dietetics discipline identified from the Australian standards were coded to the other dietetic organization's standards. Concurrently, it was proposed that any new concepts from the other standards not identified in the Australian standards would be added to the coding framework and coded against the other organizations' standards. Thus, the coding framework would be a composite of concepts from all standards. In the second step of data analysis, content analysis (Bowen, 2009; Peddle, Bearman, Radomski, McKenna, & Nestel, 2018; Schoenmakers, Damron-Rodriguez, Frank, Pianosi, & Jukema, 2017) using the coding framework was conducted by the first author. Using QSR International's NVivo 11 software, counting of the concepts coded to all statements was undertaken to identify the most frequently occurring concepts (Leech & Onwuegbuzie, 2011). The median and interquartile points (25th and 75th) for the proportion of statements coded to each

concept within a standard was calculated. The number of concepts where the proportion of statements coded within the document was less than the 25th percentile and higher than the 75th percentile was compared. Concepts were grouped into domains based on common learning outcomes recommended for entry-level healthcare graduates in Australia (O’Keefe, Henderson & Pitt, 2011) and broad areas of nutrition and dietetic practice. The domains included 'critically applying evidence,' 'professional behavior,' 'promoting and optimizing health,' 'safe and effective healthcare,' 'nutrition care planning' plus 'bioscience,' and 'food and nutrition science.'

2. 4 Trustworthiness

Throughout data analysis, there was a back and forth interplay with the standards and coding framework to ensure consistency in the allocation of codes across all professional standards. Final rechecking of standards where a concept was not first coded was conducted by the research team, independent of each other using the coding framework and findings compared. If new concepts emerged during the analysis of the standards of the other dietetics’ organizations, these would be added to the framework. There were, however, no new concepts that emerged during data analysis. There were regular interrater checks where the research team reviewed coding and discussed discrepancies and consistencies to achieve consensus.

3.0 RESULTS

A total of ten standards from ten documents (ACEND, 2016; ACEND, 2017a; BDA, 2013; DAA 2015; DBNZ, 2017; CORU - Regulating Health & Social Care

Professionals [CORU], & Dietitians Registration Board [DRB], 2014; EFAD, 2016; HPCSA & PBDN, 2017; ICDA, 2016; PDEP, 2013) developed by nine English speaking international dietetic organizations representing 48 countries, were selected for data analysis. Fifty-six concepts were identified (Figure 1). A total of 1007 performance criteria (or equivalent) statements were analyzed. The four most frequent concepts coded across all statements were 'critical thinking' (22%), 'communication' (16%), 'nutrition and dietetic service' (13%) (e.g., the provision of nutrition care to improve health outcomes), and 'quality assurance and improvement' (12%). The remaining 52 concepts together contributed to 37% of statements coded. The median of the proportion of statements coded to a concept within each standard ranged from 1.5% to 25%. There was a wide spread in the occurrence of some concepts across the standards (Figure 1). There were 55 concepts common to all standards and 'food security' common to nine of the ten standards (Figure 2), which was not identified in the United States standards for coordinated programs (ACEND, 2016).

4.0 DISCUSSION

This study is the first of its kind to identify core concepts for the dietetics discipline and to compare concepts across nutrition and dietetic competency standards worldwide. The process of document analysis grouped the foundational knowledge required to meet dietetic competencies into a list of concepts of one- or two- word nouns or short phrases. The number of concepts identified in this study is comparable to that identified in nursing (Brussow et al., 2019; Giddens et al., 2012); however, other disciplines have identified fewer core concepts (Rowland et al., 2011). This study identified concepts

that are common across other disciplines, such as professional behavior, collaboration, communication, and leadership (Brussow et al., 2019; Burch, Burch, Heller & Batchelor, 2015; Giddens et al., 2012), and those that are discipline-specific (e.g., food security, food systems, nutritional status, food properties).

As concepts are timeless, universal and transfer across situations and culture they are transferrable to different contexts. The concepts developed from the data analysis were common to most of the standards; however, the proportion of statements coded to a concept within each set of standards varied. Differences between the focus on concepts can be related to contextual differences within which the standard is developed, cultural differences, and health priorities of the country of the organization that developed the standard (Schoenmakers et al., 2017). For example, within the standards of the Republic of Ireland (CORU & DRB, 2014) and United Kingdom (BDA, 2013), there are more frequent concepts related to 'professional behaviors,' and less of a focus on concepts related to 'bioscience,' 'nutrition care planning,' 'food and nutrition science,' 'promoting and optimizing health,' and 'critically applying evidence.' In this case, both standards must comply with the proficiency standards of their respective countries' health professional regulating body. These regulations focus mostly on generic professional attributes and safe practice and less on discipline-specific attributes. However, unlike the Republic of Ireland standards (CORU & DRB, 2014), the United Kingdom standards (BDA, 2013) were not the proficiency standards of the regulating body but a curriculum framework that included more statements underpinning knowledge, skills and attributes specific to nutrition and dietetics. The differences found between the focus of concepts between the existing and newer standards from the

United States (2016; 2017a) reflects the work of the Academy of Nutrition and Dietetics to develop new standards that address the drivers of future nutrition and dietetic practice and future education needs (ACEND, 2017b; Kicklighter et al., 2017). For example, in the new United States standards for graduate degree programs the higher frequency of nutrition care planning concepts, including 'disease and dysfunction' and 'fluid and electrolyte balance' found in this study, is consistent with the academy's recognition of the need for knowledge and skills required to address increasing medical complexity (ACEND, 2017b). Although the analysis in this study did not identify 'food security' from the core knowledge and competency statements of the United States standards for coordinated programs (ACEND, 2016), this does not imply that food security is not included in the dietetics curriculum. Food security is defined by the World Food Summit of 1996 as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Food and Agriculture Organisation [FAO], 2006). Given the global understanding of the importance of access to nutritious food as a critical determinant of health (FAO, 2006), the role of the dietitian in food security would be considered essential.

The commonality of the standards from EFAD (2016) and the ICDA (2016) reflects their similar purpose, structure, and terminology, which is to describe minimum competencies required of an entry-level dietitian as a benchmark for member organizations across Europe and the world. While six of the dietetic organizations included in this study are members of these international organizations, variations on the emphasis of concepts, suggests that competency standards reflect the health,

political, economic, social, and cultural context of different countries. To meet the challenges of healthcare in the 21st century and create a health professional workforce that can operate in a global health system, authors of a Lancet Commissions report (Frenk et al., 2010) proposed that across different countries health professional competencies be adapted to local contexts for local effectiveness, drawing on global knowledge and experiences to guide curricula.

Comparison of the concepts across the different international dietetic standards found the highest proportion of statements coded to 'critical thinking' and 'communication.' This finding aligns with a document analysis study by Peddle, Bearman, Radomski, Mckenna, and Nestel (2018) exploring common non-technical skills in competency standards of 11 different health professions in Australia, which found that elements related to communication and decision-making skills (the attributes of which are similar to that of critical thinking) were the most frequently coded.

A recent exploration of data used in the development of competency standards for dietitians in Australia from 1991 to 2014, identified 'communicating for better care,' 'scientific enquiry for effective practice,' 'critical thinking and evidence-based practice,' and 'professionalism,' as core themes of nutrition and dietetic practice (Ash, Palermo, & Gallegos, 2019). The organization of concepts into logical groupings that make sense to the discipline can facilitate curriculum design and development (Giddens et al., 2012). It is vital, therefore, that there is mutual understanding of the definition and classification of concepts in dietetics, to successfully translate these into the curriculum

(Higgins & Reid, 2017). Although the concepts developed in this study were defined through either online dictionaries or search of relevant literature, dietitians may have a different understanding of the meaning of these concepts.

This study is only the first step in understanding concepts in dietetics. The next step towards the development of a curriculum that promotes conceptual learning is to clarify the concepts identified in this study to help develop a mutual understanding within dietetics as to the meaning of the concept and the interrelatedness of all concepts as they relate to dietetic practice. For example, within the context of a discipline, concepts can be clarified through the method of concept analysis to define the attributes of a concept and to create standard terminology (Fawcett, 2012) and using exemplars to teach concepts can help students, educators and curriculum planners to understand how the concepts are applied in practice (Brady et al., 2008). From an international perspective, if concepts are universal, then they could apply to any dietetics education program in any country, as suggested by the commonality seen across the different standards analyzed in this study. Exemplars also consider the health and cultural context of a country and show how the concept would be applied by the dietetic profession to meet local population needs. Further research is needed to investigate if the dietetic profession views the concepts developed from this analysis as representative of current practice as well as concepts that will be required for the profession into the future.

4.1 Study limitations

The initial development of concepts using the Australian standards may have influenced the analysis; however, this was acknowledged through researcher reflexivity and discussions between all authors. Furthermore, familiarity with these standards by the first author enhanced the interpretation of competencies and mapping to concepts. The challenge to coding was the different hierarchical structure of the competency standards and the terminology used between standards. For example, although there were common groupings of themes of practice across the competency standards such as those related to professionalism, collaboration, communication, leadership, management, quality, nutrition and dietetic care, and integrating evidence, there were differences in the number of themes, the use of terminology, and how the competency and performance criteria statements were classified under each theme. The selection of statements to analyze may have influenced the analysis of the standards from the Republic of South Africa and Canada. Whether these concepts are similar for non-English speaking countries is unknown, and thus while applicable to many nations, it is possible that some concepts are not captured in this study.

4.2 Implications for dietetics education

In dietetics education, it is impossible to cover content on all diseases and nutritional disorders that are relevant to dietetics practice. Requiring students to memorize the facts for only a few diseases may inhibit their progress and exacerbate stress on placement when exposed to different diseases and conditions they do not know. Teaching concepts of how the body works and responds to disease plus using relevant exemplars that apply to dietetic practice across different lifespan groups may enable

students to make connections to previous knowledge of the relevant concepts and critically think through the process of how to approach nutrition care. For dietetics education programs to adapt to future changes in healthcare, nutrition science, and dietetic practice, there is a need to liberate the curriculum. Developing critical thinking skills through conceptual learning approaches is more time-intensive. Curriculum reform is needed to allow more time for student-centered activities that promote these skills. As such curricular designed around concepts and exemplars could offer a solution to content-laden nutrition and dietetics curricula.

5.0 CONCLUSION

The concepts that emerged from this study were common across different dietetics organizations across the world. However, there were differences on the emphasis of concepts which may be related to the contextual differences between the countries. Further exploration of how the concepts of the discipline translate into knowledge attributes and guide curriculum priorities that meet the future needs of dietetic practice, address the overcrowded curriculum and promote conceptual learning is warranted.

AUTHOR CONTRIBUTIONS

Study design: J.T., F.E.P., C.P. and H.H.W.

Data collection: J.T. with supervision from F.E.P.

Data analysis: J.T., F.E.P., C.P. and H.H.W.

Manuscript writing and revisions for important intellectual content: J.T., F.E.P., C.P. and H.H.W.

REFERENCES

- Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. (2016). *ACEND accreditation standards for nutrition and dietetics coordinated programs (CP)*. Retrieved from <https://www.eatrightpro.org/-/media/eatrightpro-files/acend/about-program-accreditation/accreditation-standards/2017-standardsforcpprograms.pdf>
- Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. (2017a). *Accreditation standards for graduate degree programs in nutrition and dietetics (FG) (Future Education Model)*. Retrieved from <https://www.eatrightpro.org/-/media/eatrightpro-files/acend/futureeducationmodel/fem-graduatefinal.pdf>
- Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. (2017b). *Rationale for future education preparation of nutrition and dietetics practitioners*. Retrieved from <https://www.eatrightpro.org/-/media/eatrightpro20%files/acend/futureeducationmodel/finalrationale.ashx>
- Ausubel, D.P. (2000). The Nature of Meaning and Meaningful Learning. In D.P. Ausubel (Ed.), *The Acquisition and Retention of Knowledge: A Cognitive View* (pp. 67-100). Dordrecht: Springer Netherlands

- Ash, S., Palermo, C., & Gallegos, D. (2019). The contested space: The impact of competency-based education and accreditation on dietetic practice in Australia. *Nutrition & Dietetics*, 76(1), 38-46. doi:10.1111/1747-0080.12430
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27-40. doi:10.3316/QRJ0902027
- Brady, D., Welborn-Brown, P., Smith, D., Giddens, J., Harris, J., Wright, M., & Nichols, R. (2008). Staying afloat: Surviving curriculum change. *Nurse Educator*, 33(5), 198-201. doi:10.1097/01.NNE.0000334776.05643.30
- Bristol, T. J., & Rosati, L. J. (2013). Successful concept-based learning through the integration of technology. *Teaching and Learning in Nursing*, 8, 112-116. doi:10.1016/j.teln.2013.04.001
- British Dietetic Association (BDA). (2013). *A Curriculum Framework for Pre-registration Education and Training of Dietitians*. Retrieved from <https://www.bda.uk.com/training/practice/preregcurriculum>
- Brussow, J. A., Roberts, K., Scaruto, M., Sommer, S., & Mills, C. (2019). Concept-based curricula: A national study of critical concepts. *Nurse Educator*, 44(1), 15-19. doi:10.1097/NNE.0000000000000515
- Burch, G. F., Burch, J. J., Heller, N. A., & Batchelor, J. H. (2015). An empirical investigation of the conception focused curriculum: The importance of introducing undergraduate business statistics students to the "real world". *Decision Sciences Journal of Innovative Education*, 13(3), 485-512. doi:10.1111/dsji.12074
- Cadorin L, Bagnasco A, Rocco G, Sasso L. (2014). An integrative review of the characteristics of meaningful learning in healthcare professionals to enlighten

educational practices in health care. *Nursing Open*. 1(1), 3-14. doi:

10.1002/nop2.3

Camp, K.M., Trujillo, E. (2014). Position of the Academy of Nutrition and Dietetics:

Nutritional Genomics. *Journal of the Academy of Nutrition and Dietetics*,

114(2), 299-312. doi: 10.1016/j.jand.2013.12.001

CORU - Regulating Health & Social Care Professionals, & Dietitians Registration

Board. (2014). *Criteria and standards of proficiency for education and training programmes*. Retrieved from

http://coru.ie/uploads/documents/DRB_CSOP_FINAL_MF_25_02_14.pdf

Dietitians Association of Australia. (2015). *National competency standards for*

dietitians in Australia. Retrieved from [https://daa.asn.au/wp-](https://daa.asn.au/wp-content/uploads/2017/01/NCS-Dietitians-Australia-1.0.pdf)

[content/uploads/2017/01/NCS-Dietitians-Australia-1.0.pdf](https://daa.asn.au/wp-content/uploads/2017/01/NCS-Dietitians-Australia-1.0.pdf)

Dietitians Association of Australia. (2017). *Accreditation standards for dietetic*

education programs, version 2.0. Retrieved from [https://daa.asn.au/wp-](https://daa.asn.au/wp-content/uploads/2016/06/DAA-Accreditation-Standards-2017-1.pdf)

[content/uploads/2016/06/DAA-Accreditation-Standards-2017-1.pdf](https://daa.asn.au/wp-content/uploads/2016/06/DAA-Accreditation-Standards-2017-1.pdf)

Dietitians Board New Zealand. (2017). *Professional Standards & Competencies for*

Dietitians. Retrieved from

[https://www.dietitiansboard.org.nz/Portals/12/Professional%20Standards%20an](https://www.dietitiansboard.org.nz/Portals/12/Professional%20Standards%20and%20Competencies%20for%20Dietitians%20Web%20Version.pdf)
[d%20Competencies%20for%20Dietitians%20Web%20Version.pdf](https://www.dietitiansboard.org.nz/Portals/12/Professional%20Standards%20and%20Competencies%20for%20Dietitians%20Web%20Version.pdf)

Dietitians Board New Zealand. (2018). *Guidelines for accreditation of New Zealand*

dietetic education programmes. Retrieved from

[https://www.dietitiansboard.org.nz/Portals/12/Documents/NZDB%20AccredGui](https://www.dietitiansboard.org.nz/Portals/12/Documents/NZDB%20AccredGuidelines%20Mar2019%20B.pdf)
[delines%20Mar2019%20B.pdf](https://www.dietitiansboard.org.nz/Portals/12/Documents/NZDB%20AccredGuidelines%20Mar2019%20B.pdf)

- European Federation of the Associations of Dietitians. (2016). *Revised dietetic competence and the six domains of dietetic competency in Europe attained at the point of qualification and entry to the profession of dietetics (European dietetic competence or EDC)*. Statement by the European Federation of the Associations of Dietitians (EFAD). Retrieved from <http://www.efad.org/media/1418/revised-dietetic-competence-and-6-domains-of-competency.pdf>
- Erickson, H. L., Lanning, L. A., & French, R. (2017). *Concept-based curriculum and instruction for the thinking classroom: Second edition*. Retrieved from <https://play.google.com/books/reader?id=NSDmDAAAQBAJ&printsec=frontcover&output=reader&hl=en&pg=GBS.PT5>
- Ernst & Young. (2018). *Can the universities of today lead learning for tomorrow?: The university of the future*. Ernst & Young Global Limited. Retrieved from <https://cdn.ey.com/echannel/au/en/industries/government---public-sector/ey-university-of-the-future-2030/EY-university-of-the-future-2030.pdf>
- Fawcett, J. (2012). Thoughts on concept analysis: Multiple approaches, one result. *Nursing Science Quarterly*, 25(3), 285-287. doi:10.1177/0894318412447545
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), 80-92. doi:10.1177/160940690600500107
- Fletcher, K. A., Hicks, V. L., Johnson, R. H., Laverentz, D. M., Phillips, C. J., Pierce, L., . . . Gay, J. E. (2019). A concept analysis of conceptual learning: A guide for

educators. *Journal of Nursing Education*, 58(1), 7-15. doi:10.3928/01484834-20190103-03

Food and Agriculture Organisation. (2006). *Food Security*. FAO Agricultural and Development Economics Division. Retrieved from http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf

Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., . . . Zurayk, H. (2010). Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *The Lancet*, 376(9756), 1923-1958. doi:10.1016/S0140-6736(10)61854-5

Giddens, J. F., & Brady, D. P. (2007). Rescuing nursing education from content saturation: The case for a concept-based curriculum. *Journal of Nursing Education*, 46(2), 65-69. doi: 10.3928/01484834-20070201-05

Giddens, J. F., Wright, M., & Gray, I. (2012). Selecting concepts for a concept-based curriculum: Application of a benchmark approach. *Journal of Nursing Education*, 51(9), 511-515. doi:10.3928/01484834-20120730-02

Gonczi, A. (1999). Competency-based learning: a dubious past – an assured future? In *Understanding learning at work*. D. Boud & J. Garrick (Ed.), (pp.180-195). London: United Kingdom, Routledge

Hardin, P. K., & Richardson, S. J. (2012). Teaching the concept curricula: Theory and method. *Journal of Nursing Education*, 51(3), 155-159. doi:10.3928-01484834-20120127-01

Health Professions Council of South Africa, & Professional Board for Dietetics and Nutrition (2017). *The scope and competencies of the new dietitian-nutritionist*

in the well-being of the South African population with associated assessment criteria for entry-level dietitian-nutritionist. Retrieved from https://www.hpcsa.co.za/Uploads/editor/UserFiles/downloads/dietetics/Competencies_with_assessment_criteria_March%202017_Final.pdf

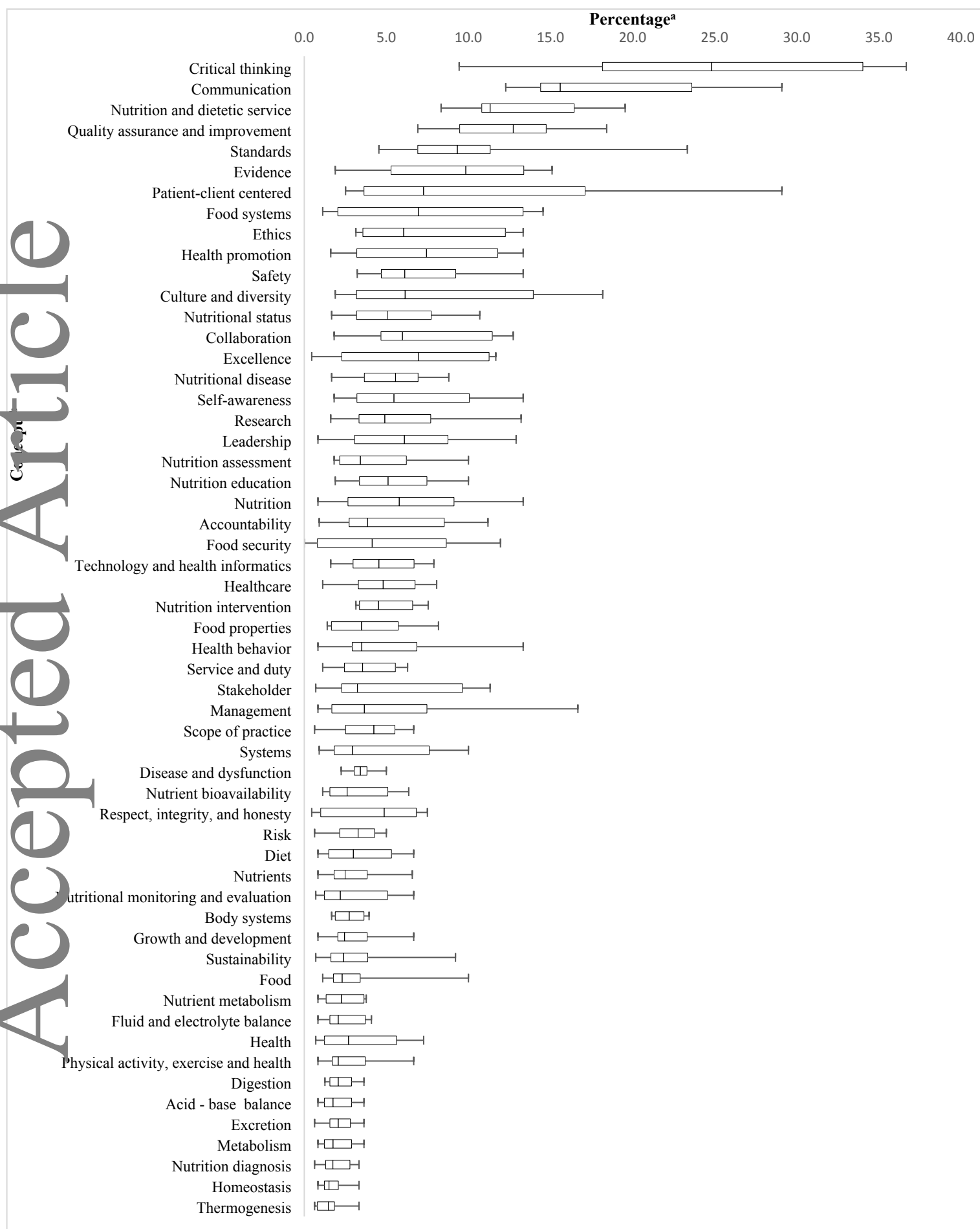
- Hendricks, S.M., Wangerin, V. (2017). Concept-based curriculum: Changing attitudes and overcoming barriers. *Nurse Educator*, 42(3), 138-142. doi: 10.1097/NNE.0000000000000335
- Hendricks, S.M., Taylor, C., Walker, M., Welch, J. A. (2016). Triangulating competencies, concepts, and professional development in curriculum revisions. *Nurse Educator*, 41(1), 33-36. doi: 10.1097/NNE.0000000000000198
- Hickson, M., Child, J., & Collinson, A. (2018). Future Dietitian 2025: informing the development of a workforce strategy for dietetics. *Journal of Human Nutrition and Dietetics*, 31(1), 23-32. doi: 10.1111/jhn.12509
- Higgins, B., & Reid, H. (2017). Enhancing “conceptual teaching/learning” in a concept-based curriculum. *Teaching and Learning in Nursing*, 12(2), 95-102. doi:10.1016/j.teln.2016.10.005
- Institute of Medicine. (2003). *Health Professions Education: A Bridge to Quality*. Washington, DC: The National Academies Press. doi: 10.17226/10681
- International Confederation of Dietetic Associations. (2014). *International Standards for Dietitians-Nutritionists*. Retrieved from <https://www.internationaldietetics.org/Downloads/International-Definition-of-Dietitian.aspx>
- International Confederation of Dietetic Associations. (2016). *International Competency Standards for Dietitian-Nutritionists*. Retrieved from

<https://www.internationaldietetics.org/Downloads/International-Competency-Standards-for-Dietitian-N.aspx>

- Kicklighter, J. R., Dorner, B., Hunter, A. M., Kyle, M., Pflugh Prescott, M., Roberts, S., . . . Byrne, C. (2017). Visioning report 2017: A preferred path forward for the Nutrition and Dietetics Profession. *Journal of the Academy of Nutrition and Dietetics*, 117(1), 110-127. doi:10.1016/j.jand.2016.09.027
- Leech, N. L., & Onwuegbuzie, A. J. (2011). Beyond constant comparison qualitative data analysis: Using NVivo. *School Psychology Quarterly*, 26(1), 70-84. doi:10.1037/a0022711
- McGrath, B. (2015). The Development of a Concept-Based Learning Approach as Part of an Integrative Nursing Curriculum. *Whitireia Nursing and Health Journal*, 22, 11 -17.
- O'Keefe, M., & Henderson, A., Pitt, R. (2011). *Learning and Teaching Academic Standards Project. Health, Medicine and Veterinary Science: Learning and Teaching Academic Standards Statement June 2011*. Australian Learning and Teaching Council (ALTC). Retrieved from http://disciplinestandards.pbworks.com/w/file/fetch/52723773/altc_standards_HMVS_210611.pdf.
- Palermo, C. (2017). Creating the dietitians of the future. *Nutrition & Dietetics*, 74(4), 323-326. doi:10.1111/1747-0080.12376
- Partnership for Dietetic Education and Practice. (2013). *The Integrated Competencies for Dietetic Education and Practice [ICDEP], Version 2.0*. Retrieved from <https://www.Dietitians.ca/Downloads/Public/ICDEP-April-2013.aspx>

- Peddle, M., Bearman, M., Radomski, N., McKenna, L., & Nestel, D. (2018). What non-technical skills competencies are addressed by Australian standards documents for health professionals who work in secondary and tertiary clinical settings? A qualitative comparative analysis. *BMJ Open*, 8(8). doi:10.1136/bmjopen-2017-020799
- Rowland, S. L., Smith, C. A., Gillam, E. M. A., & Wright, T. (2011). The concept lens diagram: A new mechanism for presenting biochemistry content in terms of "big ideas". *Biochemistry and Molecular Biology Education*, 39(4), 267–279.
- Schoenmakers, E. C., Damron-Rodriguez, J., Frank, J. C., Pianosi, B., & Jukema, J. S. (2017). Competencies in European gerontological higher education. An explorative study on core elements. *Gerontology & Geriatrics Education*, 38(1), 5-16. doi:10.1080/02701960.2016.1188812
- Tagtow, A., Robien, K., Bergquist, E., Bruening, M., Dierks, L., Hartman, B. E., ... Wilkins, J. (2014). Academy of Nutrition and Dietetics: Standards of Professional Performance for Registered Dietitian Nutritionists (Competent, Proficient, and Expert) in Sustainable, Resilient, and Healthy Food and Water Systems. *Journal of the Academy of Nutrition and Dietetics*, 114(3), 475 – 488.e24. doi:10.1016/j.jand.2013.11.011

FIGURE 1 The proportion of the total number of statements coded per concept across all standards



^aInterquartile points and median of the proportion of statements coded per concept, within each standard.

^b Concepts listed in descending order of the proportion of the total number of statements coded (n=1007)

FIGURE 2 The proportion of performance criteria (or equivalent) statements from international dietetics competency standards coded to each concept

Concepts grouped into domains ^a											
<div> <div>25th percentile</div> <div>25th to 75th percentile</div> <div>>75th percentile</div> </div>		ACEND (2016) ^b	ACEND (2017) ^c	BDA ^d	CORU &DRB ^e	DAA ^f	DBNZ ^g	EFAD ^h	HPCSA & PBDN ⁱ	ICDA ^j	PDEP ^k
Critically applying evidence											
Critical thinking											
Evidence											
Research											
Professional behavior											
Patient-client centered											
Ethics											
Culture and diversity											
Excellence											
Self-awareness											
Leadership											
Accountability											
Service and duty											
Scope of practice											
Respect, integrity, and honesty											
Promoting and optimizing health											
Communication											
Health promotion											
Nutrition education											
Health behavior											
Sustainability											
Health											
Safe and collaborative healthcare											
Quality assurance and improvement											
Standards											
Safety											
Collaboration											
Technology and health informatics											
Healthcare											
Stakeholder											
Management											
Systems											
Research											
Nutrition care planning											
Nutrition and dietetic service											
Nutritional status											

Nutrition care planning (continued)										
Nutritional disease										
Nutrition assessment										
Food security										
Nutrition intervention										
Disease and dysfunction										
Diet										
Nutritional monitoring and evaluation										
Growth and development										
Physical activity, exercise and health										
Nutrition diagnosis										
Food and nutrition science										
Food systems										
Nutrition										
Food properties										
Nutrient bioavailability										
Nutrients										
Food										
Nutrient metabolism										
Bioscience										
Body systems										
Fluid and electrolyte balance										
Digestion										
Acid - base balance										
Excretion										
Metabolism										
Homeostasis										
Thermogenesis										

^a Categories are presented in descending order of the median of the combined proportion of statements coded to each concept within each category. Within each category the concepts are presented in descending order of the proportion of statements coded to each concept within each set of standards.

^b Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. *ACEND Accreditation Standards for Nutrition and Dietetics Coordinated Programs (CP)* (2016) - 62 statements.

^c Accreditation Council for Education in Nutrition and Dietetics of the Academy of Nutrition and Dietetics. *Accreditation Standards for Graduate Degree Programs in Nutrition and Dietetics (FG) (Future Education Model)* (2017) - 220 statements.

^d British Dietetic Association. *A Curriculum Framework for Pre-registration Education and Training of Dietitians* (2013) - 143 statements.

^e CORU - Regulating Health & Social Care Professionals, & Dietitians Registration Board. *Criteria and Standards of Proficiency for Education and Training Programmes* (2014) - 120 statements

^f Dietitians Association of Australia. *National Competency Standards for Dietitians in Australia* (2015) - 55 statements.

^g Dietitians Board New Zealand. *Professional Standards & Competencies for Dietitians* (2017) - 76 statements.

^h European Federation of the Associations of Dietitians. *Revised Dietetic Competence and the six domains of dietetic competency in Europe: Attained at the point of qualification and entry to the profession of Dietetics (European Dietetic Competence or EDC). Statement by the European Federation of the Associations of Dietitians (EFAD)*. Statement by the European Federation of the Associations of Dietitians (EFAD) 201628 - 89 statements.

ⁱ Health Professions Council of South Africa & Professional Board for Dietetics and Nutrition. *The Scope and Competencies of the New Dietitian-Nutritionist in the Well-Being of the South African Population with Associated Assessment Criteria for Entry-Level Dietitian-Nutritionist* (2017) - 159 statements.

^j International Confederation of Dietetic Associations. *International Competency Standards for Dietitian-Nutritionists* (2016) - 53 statements.

^k Partnership for Dietetic Education and Practice. *The Integrated Competencies for Dietetic Education and Practice [ICDEP], Version 2.0* (2013) - 30 statements.