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Beyond Prompting: Embedding Ethical and Equity-Oriented Artificial Intelligence Literacy within the Canadian Dental Public Health Competency Framework

Anil Menon[1], Abdulrahman Ghoneim[2], Keith Da Silva[3], Vinay Pilly[4], and Kalyani Baldota[5]
(corresponding author e-mail: anil.menon@umanitoba.ca)

[1]Dr. Gerald Niznick College of Dentistry, University of Manitoba, Winnipeg, MB, Canada
[2]Faculty of Dentistry, Dalhousie University, Halifax, NS, Canada
[3]Schulich School of Medicine and Dentistry, University of Western Ontario, London, ON, Canada
[4]Private dental practitioner in Texas, USA
[5]Royal College of Dental Surgeons of Ontario, Toronto, ON, Canada

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ABSTRACT
Artificial intelligence (AI) is rapidly reshaping health professions education. However, structured AI literacy has not been consistently incorporated into dental public health (DPH) curricula. The Discipline Competencies for Dental Public Health developed by the Canadian Association of Public Health Dentistry (CAPHD) remain a key framework for articulating the knowledge, skills, and attitudes of DPH in Canada; published in 2008, they predate the contemporary generative AI era. Risks posed by unstructured and unsupervised AI use in DPH education extend beyond academic integrity and include inaccurate interpretation of population oral health data, fabricated or unverifiable evidence, algorithmic bias affecting underserved populations, privacy risks involving patient and community information, insufficient attention to Indigenous data governance and cultural safety, and weakened accountability in policy and advocacy work. This conceptual paper proposes an author-developed, five-level AI literacy model mapped onto the eight CAPHD competency domains and four competency layers (Basic Shared, Foundation, Advanced, Expert). The five levels are foundational AI literacy, responsible student and practitioner use, dental public health applications, equity, ethics, and population health judgment, and professional accountability. The model has not yet undergone external validation. It is intended to support curriculum planning, graduate and residency training, community oral health programs, continuing professional development, and future consensus-building around competency renewal.

KEYWORDS AI literacy, dental public health, discipline competencies, health professions education, equity, cultural safety, Indigenous data governance, professional accountability

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Introduction

Generative artificial intelligence (AI) tools have entered routine use among health professions students and practitioners with a speed that has outpaced curricular response. In dental public health (DPH), residents increasingly use large language models for literature search, evidence synthesis, surveillance interpretation, program planning, and academic writing, often without formal preparation in their accuracy, limitations, or population-level implications. As AI tools become increasingly available to students and practitioners, DPH residents may develop AI-use habits without explicit competencies, formal supervision, or shared standards.

DPH education and workforce development in Canada are anchored by the Discipline Competencies for Dental Public Health (2008), developed by the Canadian Association of Public Health Dentistry (CAPHD) with support from the Public Health Agency of Canada [1]. The framework articulates eight competency domains across four layers and informs curriculum planning, graduate and residency training, and continuing professional development. It does not, however, address AI because it predates the contemporary generative AI era.

This paper proposes a five-level AI literacy model mapped to the CAPHD Discipline Competencies to guide curriculum development, residency training, continuing professional development, and future competency renewal in Canadian dental public health. The model draws on emerging international and national AI literacy, digital health, health professions education, and public health workforce models and extends them to the distinctive responsibilities of DPH. The model proposed in this manuscript is intended as a scholarly contribution and does not represent an official CAPHD position.

Background

The CAPHD Discipline Competencies

The CAPHD Discipline Competencies (Release 4.0, 2008) describe the essential knowledge, skills, and attitudes that are required for the practice of dental public health in Canada [1]. The framework is organized into eight domains: Oral Public Health Sciences; Oral Health Assessment and Analysis; Oral Health Program Planning, Implementation and Evaluation; Oral Health Policy Planning, Implementation and Evaluation; Partnerships, Collaboration and Advocacy; Diversity and Inclusiveness; Communication; and Leadership. Within each of these domains, competencies are articulated across four progressively complex layers: Basic Shared, Foundation, Advanced, and Expert. The DPH framework is explicitly grounded in core public health values of equity, social justice, sustainable development, community participation, and respect for diversity.

The Educational Gap

Three gaps motivate this work. First, the CAPHD discipline competencies, while comprehensive, contain no AI-specific competency statements. Second, DPH curricula across Canadian universities have not yet adopted a consistent structure for introducing AI literacy at the undergraduate, graduate, or continuing education level. Third, existing AI literacy frameworks developed for general education or clinical disciplines have not appropriately addressed the equity, cultural safety, and Indigenous data governance dimensions of AI use within oral health, especially for First Nations, Inuit, and Métis communities and other equity-deserving populations.

Educational and Public Health Frameworks Informing the Proposed Model

A widely cited formulation of AI literacy was provided by Long and Magerko (2020), who define AI literacy as "a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace" [2]. Through an interdisciplinary review of literature on AI education, perceptions, and practice, they organized seventeen AI literacy competencies under five thematic questions: what AI is, what it can do, how it works, how it should be used, and how people perceive it, and articulated fifteen design considerations to guide learner-centred AI education. This foundational framework informs much of the subsequent literature on AI literacy in education and the workplace, and is adopted in the present paper as the working definition of AI literacy. The model proposed below extends this general definition for the specific responsibilities of dental public health practice.

The proposed model is informed by emerging AI and digital health education frameworks from Europe and North America. A dental-specific precedent is provided by Schwendicke and colleagues, who developed a core curriculum for artificial intelligence in oral and dental healthcare through expert input and Delphi consensus involving the IADR e-oral health network, the ITU/WHO Focus Group AI for Health, and the Association for Dental Education in Europe [3]. Their curriculum identifies foundational AI knowledge, oral and dental AI use cases, evaluation of AI applications, and broader issues including generalizability, representativeness, explainability, autonomy, accountability, and governance. This work provides an important foundation for AI education in dentistry. However, it is not specifically mapped to dental public health competencies and does not operationalize AI literacy through population oral health surveillance, public health policy, program evaluation, community engagement, Indigenous data governance, or equity-oriented professional accountability. The proposed model builds on this dental AI curriculum precedent by translating AI literacy into the CAPHD dental public health competency architecture. UNESCO's AI competency frameworks for students and teachers emphasize human-centred AI, ethics, foundational knowledge, application, and progressive development [4,5]. In health professions education, the Association of American Medical Colleges (AAMC) is developing AI competencies across the learning continuum, while the DECODE framework illustrates how digital health competencies can be organized into domains and learning outcomes [6,7]. In public health, the Association of Schools and Programs of Public Health (ASPPH) final AI framework report and Canada's AI for Public Health (AI4PH) initiative highlight the need for responsible, ethical, and equitable AI capacity-building in public health education, research, policy, and practice [8,9]. Canada's updated public health core competencies also emphasize data, equity, ethical practice, and technologies, although AI literacy is not named as a discrete competency area [10]. The NHS/Health Education England DART-Ed framework further supports the

idea of AI literacy as a capability layer that extends rather than replaces existing professional competencies [11].

Building on these frameworks, the proposed model maps AI literacy onto the CAPHD Discipline Competencies to address the distinctive responsibilities of dental public health, which include oral health surveillance, program planning and evaluation, policy advocacy, community engagement, cultural safety, Indigenous data governance, and professional accountability.

Distinctive AI Competency Needs in Dental Public Health

Currently, existing AI competency frameworks address valuable but incomplete dimensions of the responsibilities held by DPH practitioners. General AI literacy frameworks, including Long and Magerko's foundational definition [2] and UNESCO's competency frameworks for students and teachers [4,5], emphasize universal foundational concepts, critical evaluation, and ethical use but are oriented to the general public and non-technical learners rather than to health system contexts. Medical AI competency models such as the AAMC's address clinical and educational applications but are oriented toward individual patient encounters and physician practice. Public health AI initiatives (ASPPH and AI4PH) address population-level applications but do not address the distinct content of oral health surveillance, prevention programming, and oral health policy. Digital health frameworks (DECODE and the NHS DART-Ed capability framework) address health workforce digital readiness broadly but are not adapted to the specific knowledge base and professional accountabilities of dental public health specialists.

DPH introduces several context-specific AI competency requirements. First, oral health surveillance relies on a small number of population data sources (such as the Canadian Health Measures Survey oral component and the Canadian Community Health Survey oral health module), each with specific sampling, weighting, and methodological constraints that AI tools are unlikely to handle correctly without expert oversight. Second, oral health policy areas such as community water fluoridation, public dental insurance, and access for equity-deserving populations are politically contested, evidence-sensitive, and especially vulnerable to misinformation, which can be amplified by generative AI. Third, dental public health practice in Canada is tied closely to Indigenous oral health as well as community-based prevention programs, where Indigenous data governance principles, cultural safety, and community participation are constitutive of competent practice rather than optional considerations. Fourth, dental public health specialists are increasingly being called upon to advise federal, provincial, territorial, regional, and municipal governments on oral health programs and policy, creating a need for explicit competencies in AI procurement, governance, and accountability that are not addressed by general public health AI frameworks. These context-specific requirements support the case for a dedicated DPH AI literacy model rather than relying on adjacent frameworks alone.

Conceptual Development Approach

This conceptual model was developed through a structured mapping exercise rather than a systematic review. The approach is best characterized as a directed competency mapping informed by framework analysis, in which existing AI and digital health competency frameworks were used as conceptual anchors and CAPHD competencies were used as the operational target architecture.

Mapping decisions followed three decision rules. First, CAPHD competencies were selected when the underlying public health function was directly affected by the use of AI, including assessment, surveillance, communication, program evaluation, policy development, advocacy, leadership, and community engagement. Second, competencies were assigned to an AI literacy level according to the primary educational task required: understanding AI concepts, using AI responsibly, applying AI to DPH functions, judging equity and ethical consequences, or exercising professional accountability. Third, each mapping was classified as one of three forms of alignment: an existing CAPHD competency that already implies a relevant capability, an existing competency that requires reinterpretation in an AI-enabled environment, or a new AI-specific capability that extends the 2008 framework. This distinction was used by the authors to avoid simply re-labelling existing competencies and to identify where new AI-related educational content is required.

Ambiguous mappings were handled through internal co-author discussion. When an AI-related capability could plausibly fit more than one CAPHD domain, the authors prioritized the domain in which the intended learner performance would most likely be taught or assessed. For example, AI-generated surveillance interpretation was mapped to Oral Health Assessment and Analysis, while AI procurement, monitoring, and organizational accountability were mapped to Leadership and Partnerships, Collaboration and Advocacy.

The selection of source frameworks was purposive. Frameworks were considered if they (i) explicitly addressed AI literacy or digital health competency within an educational or workforce context, (ii) were issued or endorsed by a national, international, or sector-level organization (rather than by a single research group), and (iii) were publicly available in English at the time of writing. The frameworks selected include UNESCO's AI competency frameworks for students and teachers, the AAMC AI competencies for medical education, the DECODE digital health competency framework, the ASPPH AI for Public Health initiative, the Canadian AI4PH initiative, Canada's updated public health core competencies, and the NHS/Health Education England DART-Ed capability framework. Together, they represent perspectives of education, health professions education, and public health workforce across multiple jurisdictions. Other frameworks may also be relevant, and the absence of a formal scoping review is acknowledged as a limitation.

Source influence was overlapping rather than exclusive. Foundational AI literacy (L1) drew chiefly from Long and Magerko, Schwendicke et al., and UNESCO; responsible use (L2) from UNESCO, AAMC, and the dental AI curriculum; applied DPH use (L3) from Schwendicke et al., DECODE, ASPPH, and AI4PH; equity and population health judgment (L4) from UNESCO, ASPPH, AI4PH, and WHO guidance; and professional accountability (L5) from AAMC, NHS DART-Ed, ASPPH, and WHO guidance. These sources were used as conceptual anchors rather than as one-to-one precedents for the CAPHD mappings.

The CAPHD Discipline Competencies were reviewed against each source framework to identify AI-related learning needs that map naturally to existing CAPHD domains and competency statements. Mapping decisions were guided by their alignment with the foundational CAPHD values, relevance to core DPH functions (surveillance, prevention, program planning and evaluation, policy, advocacy, and community engagement), and suitability across undergraduate, graduate, residency, and continuing professional development contexts. The proposed five-level structure emerged from a synthesis of the source frameworks; in particular, the layered progression draws on UNESCO's progressive development model and the NHS DART-Ed capability-layer construct, while the integration with CAPHD domains preserves the eight-domain, four-layer architecture of the existing Canadian DPH competency framework.

Initial mapping was developed by the lead author and progressively refined through internal review and discussion with co-authors. The mapping should be understood as a structured author-developed proposal intended to support discussion and consultation, and not as a validated competency framework. Subsequent steps should include external consultation, Delphi consensus development, and pilot implementation, as described in Section XI.

Proposed Model: Five-Level AI Literacy for Dental Public Health

The proposed model articulates five progressive levels of AI literacy, each integrated with specific CAPHD domains and layers. The levels are not strictly sequential within a single course but are intended to scaffold AI competency development across the trajectory of a DPH learner, from undergraduate dental student to expert specialist. Fig. 1 presents the overall conceptual structure.

The five AI literacy levels should not be interpreted as a one-to-one replacement for the four CAPHD competency layers. The CAPHD layers describe increasing professional scope and complexity, from Basic Shared to Expert, whereas the five AI literacy levels describe domains of AI-related capability. Foundational AI literacy and responsible use may begin early in training, while governance, procurement, monitoring, and organizational accountability are most relevant at advanced and expert levels. The model is therefore a competency-extension scaffold mapped onto, rather than substituted for, the CAPHD architecture.

Level 1: Foundational AI Literacy

This level would establish a working understanding of AI concepts, capabilities, applications, and limitations that are relevant to public health practice. Learners would distinguish between rule-based, machine learning, and generative AI systems; understand the role of training data and recognize common failure modes such as hallucination, bias, and miscalibrated confidence. This level integrates with CAPHD Domain 1 (Oral Public Health Sciences), specifically competencies 1.1, 1.2, 1.3, and 1.6, framing AI as a contemporary public health science. It also engages Domain 7 (Communication), competency 7.3, situating AI as a communication technology that requires deliberate, informed use.

Level 2: Responsible Student and Practitioner Use

This level would inform learners about the appropriate use of AI tools in academic and professional work, including validation, disclosure, attribution, citation verification, privacy protection, and the avoidance of plagiarism or fabrication. Level 2 corresponds to CAPHD Domain 8 (Leadership), particularly competency 8.3 (to act ethically with clients, information, and resources) and 8.7 (manage self, information, and resources in a way that honours public health ethics), and Domain 7 (Communication), competencies 7.4 and 7.6.

Level 3: Dental Public Health Applications

At level 3, learners would develop applied competence in using AI tools to support core DPH functions: population health assessment, surveillance interpretation, program planning, evidence synthesis, and policy analysis. Learners would be taught to critically appraise AI-generated outputs relative to established epidemiologic and biostatistical standards, recognizing where AI tools can misrepresent sampling design, confounding, or causal reasoning errors. This level engages CAPHD Domain 2 (competencies 2.10, 2.13, 2.16), Domain 3 (competencies 3.7, 3.8, 3.14), and Domain 4 (competencies 4.7, 4.9).

Level 4: Equity, Ethics, and Population Health Judgment

This level represents the conceptual core of the five-level model. Learners would develop judgment to identify, critique, and mitigate algorithmic bias against equity-deserving populations; interrogate the representativeness of training data; recognize that the First Nations principles of Ownership, Control, Access, and Possession (OCAP®) are specific to First Nations data governance rather than a pan-Indigenous framework [12]; attend to First Nations, Inuit, and Métis-specific governance principles, community authority, consent processes, and culturally safe approaches to data collection, interpretation, and use; safeguard cultural safety in AI-mediated practice; and weigh population-level benefits against potential surveillance harms. This level integrates with CAPHD Domain 6 (Diversity and Inclusiveness), competencies 6.4, 6.7, 6.8, and 6.9, and Domain 5 (Partnerships, Collaboration and Advocacy), competencies 5.6 and 5.9.

Level 5: Professional Accountability

At the highest level, learners would situate AI use within the regulatory, institutional, and political contexts of public health practice. Competencies here include developing policies on AI procurement and deployment for organizations, contributing to professional standards, advising public health organizations on responsible AI use in publicly funded oral health programs, and modelling ethical AI practice as a leader. This level engages CAPHD Domain 8 (Leadership), competencies 8.13, 8.14, and 8.16, and Domain 5 (Partnerships, Collaboration and Advocacy), competencies 5.12 and 5.15.

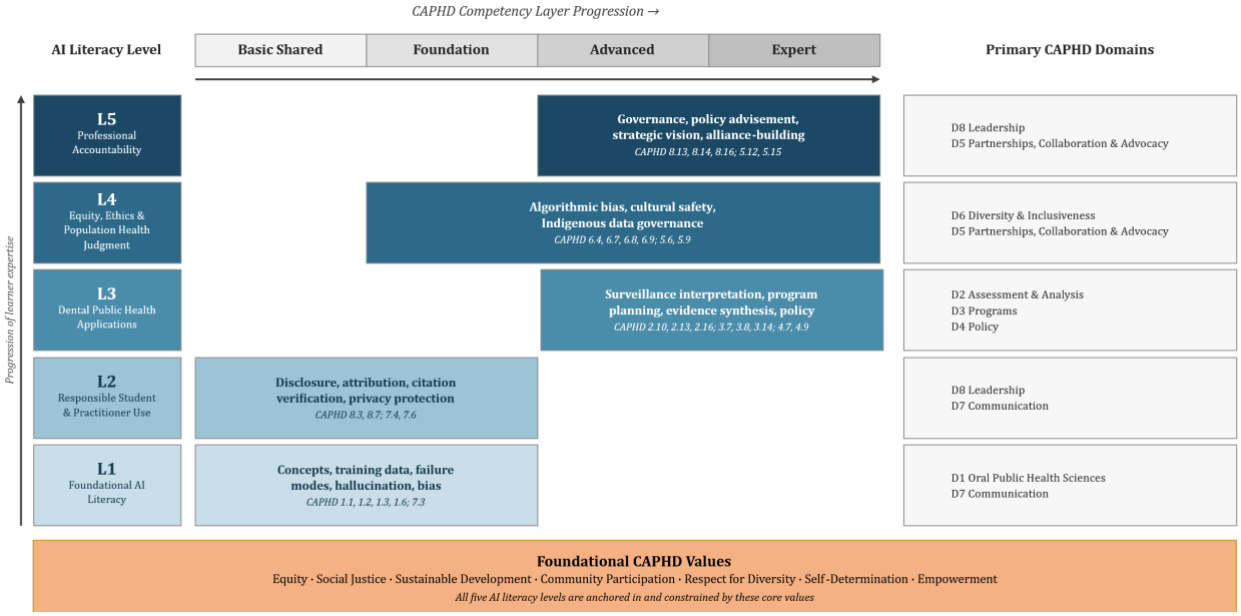


Fig. 1. Conceptual representation of the five-level AI literacy model, showing each level's primary location within the CAPHD competency layer progression, the principal CAPHD domains engaged, and the foundational CAPHD values that anchor all levels.

Table 1. Alignment of Proposed AI Literacy Levels with CAPHD Discipline Competency Domains, Statements, and Layers.

AI Literacy Level	CAPHD Domain(s)	Mapped Competencies†	CAPHD Layer
L1: Foundational AI Literacy	D1; D7	1.1, 1.2, 1.3, 1.6; 7.3	Basic Shared → Foundation
L2: Responsible Student and Practitioner Use	D8; D7	8.3, 8.7; 7.4, 7.6	Basic Shared → Foundation
L3: Dental Public Health Applications	D2; D3; D4	2.10, 2.13, 2.16; 3.7, 3.8, 3.14; 4.7, 4.9	Advanced → Expert
L4: Equity, Ethics, and Population Health Judgment	D6; D5	6.4, 6.7, 6.8, 6.9; 5.6, 5.9	Foundation → Expert
L5: Professional Accountability	D8; D5	8.13, 8.14, 8.16; 5.12, 5.15	Advanced → Expert

Note. CAPHD domains abbreviated: D1 Oral Public Health Sciences; D2 Oral Health Assessment and Analysis; D3 Oral Health Program Planning, Implementation and Evaluation; D4 Oral Health Policy Planning, Implementation and Evaluation; D5 Partnerships, Collaboration and Advocacy; D6 Diversity and Inclusiveness; D7 Communication; D8 Leadership. Competency numbers refer to statements within each domain as published in CAPHD (2008) [1].

Table 2. Alignment Between CAPHD Competencies and Proposed AI-Specific Extensions.

AI Literacy Level	Existing CAPHD Basis†	AI-Specific Extension††
L1 Foundational AI Literacy	Public health sciences; communication technology	Generative AI concepts, training data, hallucinations, model limitations, miscalibrated confidence
L2 Responsible Use	Ethical use of information; professional responsibility; communication	AI-use disclosure, citation verification, privacy protection with third-party tools, avoidance of fabricated evidence
L3 DPH Applications	Assessment, epidemiology, program planning, policy analysis	Critique of AI-supported interpretations of surveillance data, sampling weights, confounding, causal inference, and policy evidence
L4 Equity, Ethics, Population Health Judgment	Diversity, inclusiveness, cultural safety, advocacy, community development	Algorithmic bias assessment, representativeness of training data, Indigenous data governance, monitoring for disparate impacts
L5 Professional Accountability	Leadership, partnerships, strategic vision, policy engagement	AI procurement governance, transparency standards, accountability mechanisms, monitoring AI-supported public health decisions

Note. † Existing CAPHD basis refers to competencies or values already present in the 2008 framework. †† AI-specific extensions refer to proposed additions or reinterpretations needed to operationalize those competencies in an AI-enabled DPH context. These extensions are author-proposed and do not represent official CAPHD competency revisions.

Table 3. Worked Examples and Suggested Educational Settings for the Proposed AI Literacy Framework.

Level	Educational Setting	Worked Example
L1	Early residency	A first-year DPH resident will be asked to differentiate between machine learning, large language models, and generative AI; describe the concept of training data and its limitations; and identify why an LLM produces a confidently stated but incorrect answer about community water fluoridation guidance. This activity scaffolds CAPHD competencies 1.1, 1.3, and 7.3 by introducing AI as a contemporary public health science and a communication technology.
L2	Residency; CPD	During a literature review, residents will be required to provide rationale for their selected AI tool(s), maintain a structured AI disclosure log, attribute generated text correctly, verify all citations against primary sources, and reflect on the implications for patient privacy when entering clinical scenarios into a third-party model. The exercise enacts CAPHD competencies 8.3 (act ethically with clients, information and resources) and 7.4 (interpret information for non-professionals and community audiences related to oral health issues) under contemporary conditions.
L3	Residency; graduate training	Residents will use an AI-assisted analytic workflow to interrogate publicly available oral health surveillance data (for example, the Canadian Health Measures Survey oral component or the Canadian Community Health Survey oral health module), critically appraise the model's interpretation against published epidemiologic methods, and identify where AI outputs misrepresent sampling weights, confounding, or causal inference. This corresponds to CAPHD 2.10 (analyze oral health information to determine implications, uses, gaps and limitations) and 2.13 (apply research methods used in dental public health including biostatistics and epidemiology).
L4	Residency; CPD; faculty development	Residents will critique an AI risk-stratification model for caries prevention applied to an Indigenous community, examining whether training data adequately represent the relevant community; whether outputs respect appropriate community data governance, including OCAP® principles for First Nations contexts when applicable; and whether deployment is consistent with cultural safety. This operationalizes CAPHD 6.7 (apply knowledge of oral health inequities and inequalities in designing oral health programs and policies), 6.9 (create culturally safe and supportive environments within public health programs and organizations), and 5.6 (build capacity for oral health and general wellbeing through community development strategies).
L5	Senior residency; specialist CPD; leadership	Senior residents and practicing specialists will develop a position statement for their regional public health authority on the responsible procurement and deployment of AI tools in publicly funded oral health programs, including governance, accountability, monitoring for disparate impact, and stakeholder consultation. This aligns with CAPHD 8.14 (develop a strategic vision for dental health within the organization), 8.16 (build alliances and partnerships within changing political environments), and 5.12 (facilitate dialogue among governments, community partners and other stakeholders to support healthier communities).

Cross-Walk: AI Literacy by CAPHD Competency Architecture

Table 1 summarizes the alignment between the proposed AI literacy levels, the CAPHD competency domains, the specific competency statements engaged, and the CAPHD layer at which the literacy level is most relevant. Table 2 further characterizes the nature of each alignment. Together, these tables are intended as curricular planning tools for DPH educators and program directors.

Illustrative Worked Examples

Table 3 presents one illustrative worked example for each level, drawn from typical DPH educational activities, with the suggested educational setting indicated. These examples are intended to help educators in operationalizing the five-level model and are not exhaustive.

Assessment Strategies and Learning Outcomes

Effective adoption depends on the availability of defensible learning outcomes and assessment strategies. Table 4 maps each level of the model to a sample of measurable learning outcomes and to suggested assessment modalities consistent with established health professions education practice. The proposed modalities include short-answer assessments and concept-mapping at the foundational level; structured AI-use disclosure logs, citation-verification audits, and reflective writing at the level of responsible practice; rubric-based appraisal of AI-supported analytic outputs and portfolio entries at the applied level; case-based equity-and-bias critiques and Objective Structured Clinical Examination (OSCE)-style stations at the equity and ethics level; and policy memoranda, position statements, and oral defences at the professional accountability level. Across all levels, longitudinal portfolio assessment is recommended to track competency progression and consolidation across an educational program.

Educational outcomes can further be evaluated both cross-sectionally and longitudinally. Cross-sectional evaluation might include pre- and post-instruction AI literacy self-assessment, structured reflective writing, and rubric-based grading of AI-supported assignments. Longitudinal evaluation might include portfolio assessment across the course of a DPH residency, faculty review of integrated AI-related performance over time, as well as tracking of graduate practice patterns through alumni surveys. Given the rapid pace of change in AI tools, learning outcomes and assessment instruments will require periodic refresh.

Table 4. Sample Learning Outcomes and Suggested Assessment Modalities for Each AI Literacy Level.

Level	Sample Measurable Learning Outcomes	Suggested Assessment Modalities
L1	Learners can describe how generative AI models are trained and identify at least three common failure modes (hallucination, bias, miscalibrated confidence) using DPH-relevant examples.	Short-answer quiz; concept-map exercise; structured class discussion with rubric.
L2	Learners can produce a written work product accompanied by a rationale for using the selected AI tool(s); complete AI-use disclosure log; verify all AI-generated citations against primary sources; and articulate privacy implications of entering identifiable data into AI tools.	Structured AI-use disclosure log; citation-verification audit of submitted assignments; reflective writing rubric.
L3	Learners can apply AI tools to a defined DPH task (e.g., surveillance interpretation, program planning) and critically appraise AI-generated outputs against epidemiologic and biostatistical standards.	Rubric-based assessment of AI-supported analytic outputs; structured critique exercise comparing AI output to published epidemiologic evidence; portfolio entry.
L4	Learners can evaluate an AI tool for algorithmic bias affecting equity-deserving populations, assess alignment with Indigenous data governance principles, and propose mitigation strategies that uphold cultural safety.	Case-based equity-and-bias critique with rubric; OSCE-style station evaluating AI appraisal in a population-health scenario; reflective portfolio integrating cultural-safety considerations.
L5	Learners can draft an organizational or jurisdictional policy on responsible AI use in public oral health programs and defend governance, accountability, and equity-monitoring components.	Capstone policy memorandum or position statement with structured rubric; oral defence; longitudinal portfolio assessment across residency.

Risks and Limitations of Generative AI in Dental Public Health Education

Although the five-level model supports thoughtful use of AI in dental public health education, several characteristics of contemporary generative AI tools warrant explicit critical engagement. These risks shape the content of the framework and underline the importance of structured AI literacy.

Generative AI models are well known to fabricate citations, misattribute findings, and generate authoritative-sounding statements that are not supported by the underlying evidence base [13]. In a discipline where policy and program decisions are tied to surveillance data, evidence synthesis, and contested issues such as community water fluoridation, this raises major risks of misinformation entering educational and professional work without detection. Too much reliance on AI in evidence synthesis can also reduce learners' engagement with primary sources, weakening the methodological skills that the CAPHD explicitly identifies as core competencies.

AI models developed on internet-scale corpora reflect the biases and inequities of their training data. Norori and colleagues have described how data-driven, algorithmic, and human sources of bias in health AI can propagate and amplify societal inequities, with especially adverse consequences for populations historically underrepresented in biomedical datasets [14]. Within oral health, this can produce outputs that under-represent or misrepresent equity-deserving populations, including First Nations, Inuit, and Métis communities, newcomer and refugee populations, low-income groups, people with disabilities, and rural and remote communities. Without specific instruction on algorithmic bias, learners may apply AI outputs in ways that reproduce or amplify structural inequities, contrary to the foundational values of the CAPHD discipline competencies.

Most consumer-grade generative AI models are proprietary, with limited clarity about training data, model updates, content moderation policies, and downstream uses of submitted prompts. Opacity of proprietary models raises concerns about confidentiality of patient and community information, accountability for model behaviour, and the reproducibility of analyses that rely on rapidly changing models. The environmental and resource footprint of large-scale AI deployment, including energy and water use associated with model training and inference, is also a relevant population-health consideration that aligns with the CAPHD value of sustainable development and with the WHO principle of sustainable AI [15]. Finally, unequal access to advanced AI tools, including paid tiers, further widens educational and professional inequities within DPH training programs, between institutions, and across jurisdictions. A core purpose of structured AI literacy is to ensure that future DPH practitioners can recognize and respond to these risks rather than be passively exposed to them.

Discussion and Implementation Considerations

The proposed five-level model is designed to be implementable across multiple educational contexts: undergraduate dental curricula, DPH residency and graduate training, community-based oral health programs, and continuing professional development. Because it has been mapped onto the existing CAPHD architecture, it does not require institutions to adopt a parallel competency framework but instead provides curricular content that can be integrated into existing competency-based structures.

Three implementation aspects would warrant emphasis. First, the five-level model prioritizes equity, cultural safety, and Indigenous data governance as constitutive of competent AI use, not as optional add-ons. This reflects the explicit

foundational values of the CAPHD competencies and is consistent with global commitments to health equity articulated in the United Nations Sustainable Development Goals 3, 4, and 10. Second, consistent with the NHS DART-Ed view of AI literacy as a capability layer that extends rather than replaces existing professional competencies, the model intentionally distinguishes between the use of AI as a learner support tool and the use of AI as an object of professional critique; both are necessary, but they require distinct pedagogical approaches. Finally, the five-level model is intended to support future discussion on competency renewal, recognizing that the 2008 release predates the contemporary AI era.

Several implementation barriers should be anticipated. Faculty AI literacy is currently uneven, and faculty development will be needed before the five-level model can be delivered consistently. Schools can begin with low-risk introductory modules, shared AI-use disclosure templates, common rubrics, and case libraries that can be adapted locally. Faculty development should precede high-stakes learner assessment and should address AI limitations, privacy, citation verification, bias, and the use of institutional rather than personal or identifiable data in demonstrations. Institutional resources, including access to AI tools, faculty time, and ethics review capacity, vary substantially across Canadian universities. The swift pace of change in AI tools means that specific tool-based content will date quickly, requiring ongoing curriculum maintenance. Regulatory and accreditation guidance on AI use in health professions education is still emerging at federal, provincial, and territorial levels, creating uncertainty about how AI literacy should be assessed in licensure and specialty certification. These barriers support positioning the model as an implementable starting point rather than a finished prescription, allowing adaptation to local contexts.

Future Implementation and Evaluation

Future work should focus on both implementation and evaluation. Implementation can include introductory AI literacy modules, structured AI-use disclosure logs, reflective exercises, case-based critiques of equity and algorithmic bias, and rubric-based assessment of AI-supported assignments. Evaluation can include pre- and post-instruction AI literacy self-assessment, student reflections, faculty review, and review of AI-supported outputs. Pilot implementation could begin within DPH graduate or residency training and be refined through consultation with DPH educators, residents, practitioners, First Nations, Inuit, and Métis partners, community representatives, and professional organizations.

Several next steps would strengthen the scientific and practice basis of the five-level model. A modified Delphi consensus exercise involving Canadian DPH educators, residency program directors, public health dental specialists, learner representatives, First Nations, Inuit, and Métis oral health partners, and experts in health equity, data governance, and AI ethics could refine the model's content, learning outcomes, and assessment strategies. Participants would review each AI literacy level, the proposed CAPHD mappings, Table 2's extension categories, and the learning outcomes in Table 4; rate their clarity, relevance, feasibility, and completeness; and identify missing or ambiguous capabilities. National stakeholder consultation through CAPHD, the Royal College of Dentists of Canada, the Commission on Dental Accreditation of Canada, and provincial and territorial regulatory bodies can situate the five-level model within the broader Canadian DPH education and regulatory ecosystem. Pilot curriculum implementation within one or more Canadian DPH residency or graduate programs, with pre- and post-evaluation and qualitative learner feedback, can generate evidence on feasibility and educational impact. Formal validation studies, including psychometric evaluation of AI literacy self-assessment instruments and rubric-based assessment tools, would support broader adoption. Findings from these steps can inform future discussions on renewing Canadian DPH competencies for an AI-enabled public health environment.

Limitations

This paper proposes an author-developed conceptual five-level model and does not present empirical evaluation data. The mapping reflects the authors' interpretation of the CAPHD Discipline Competencies and should be refined through consultation with DPH educators, residents, practitioners, First Nations, Inuit, and Métis partners, community representatives, and professional organizations. This paper did not include a formal scoping review, and additional AI literacy and digital health competency frameworks may be relevant. This proposal is not intended to replace formal competency-renewal processes or to serve as an official CAPHD position.

Conclusion

The use of generative artificial intelligence is now an unavoidable feature of the educational and professional environment of dental public health. By building on international AI literacy and digital health frameworks, Canada's updated public health core competencies, and on the values-based architecture of the Canadian CAPHD Discipline Competencies, the proposed five-level model offers a contemporary, equity-oriented structure for embedding AI literacy across DPH education and practice. It also provides a foundation for future discussions on updating Canadian DPH competencies for an AI-enabled public health environment.

Conflict of Interest

The authors declare no conflicts of interest.

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