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The Competency Framework for Genomics Nurse Educators: An International Delphi Study to Advance Global Nursing Education

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ABSTRACT

Aim: To validate a Competency Framework for Genomics Nurse Educators, strengthening the genomics-informed nursing workforce.

Background/Introduction: A pressing global need for nurse educators equipped to build genomic literacy within the profession prompted the International Society of Nurses in Genetics to develop the Competency Framework for Genomic Nurse Educators.

Methods: A draft framework was refined using literature and stakeholder input guided by an evidence-based model for competency framework development. A modified Delphi study with an international panel of genomics nurse experts completed a three-round Delphi study. Methodology and reporting adhere to EQUATOR guidelines using the CONFERD-HP and CREDES checklists.

Results: A 24-member panel—with genomic nursing expertise spanning 13 countries—validated a set of competency statements organized into three domains covering foundational knowledge, genomics-specific teaching approaches, and contribution to the discipline through leadership and academic–practice partnerships.

Discussion: These competencies address essential aspects of genomics nursing education and respond to increasing demand for specialization within academic nursing education.

Conclusion: The validated framework addresses gaps in global genomic nursing education. This framework supports a focused approach to genomics education, preparing a new generation of nurse educators to meet the challenges of precision health.

Implications for Nursing: Implementing this framework can standardize genomics education, strengthen faculty development, and ensure nurses are prepared to practice genomics-informed nursing.

Implications for Nursing and Health Policy: Completion of the framework affirms genomics nursing education as a distinct specialty, laying groundwork for formal credentialing and shaping education priorities. Increasing the number of nurse educators with genomic expertise can strengthen academic–practice partnerships and foster global collaboration, ultimately supporting the equitable integration of precision health in nursing worldwide.

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1 | Study Aim

This study aimed to validate a Competency Framework for Genomics Nurse Educators through an international Delphi consensus process. Expert genomic nurses from diverse regions were recruited to establish consensus on essential competencies for Genomics Nurse Educators who teach within academic nursing programs worldwide. This effort supports the development of a genomics-informed nursing workforce to address the challenges of precision healthcare.

2 | Introduction and Background

Genomic science offers innovative solutions to understand, prevent, and treat disease. As a cornerstone of precision healthcare, genomics enables personalized approaches to risk assessment, diagnosis, and treatment, improving outcomes and reducing disparities. Recognizing the growing demand for genomics-informed healthcare, the World Health Organization has called for policies that accelerate the implementation of genomic technologies, with a stated priority to address health disparities and enhance care in low- and middle-income countries (World Health Organization 2022).

National initiatives, such as the UK 100,000 Genomes Project, the US Million Veteran Program, and the All of Us research initiative, illustrate how genomics is reshaping healthcare delivery and systems worldwide (Genomics England 2024; National Institutes of Health 2025; U.S. Department of Veterans Affairs 2023). These initiatives highlight the urgent need for a genomics-informed nursing workforce capable of supporting precision healthcare advancements.

2.1 | Nurses' Role in Genomics

As the largest segment of the healthcare workforce, nurses are pivotal to integrating genomics into clinical practice. Genomics is an essential element of the scope and standards of practice for all nurses, with differentiation of competencies for RN- and advanced practice (Consensus Panel on Genetic/Genomic Nursing Competencies 2009). Nurses who apply a genomics-informed approach to risk stratification, prevention strategies, and personalized care plans contribute to advancing precision healthcare in developed and developing countries (Abad and Sur 2022; Camak 2016; Fu et al. 2020). However, like other healthcare disciplines, significant gaps in genomic literacy persist, exacerbated by inconsistent integration into nursing curricula and limited educator preparation (Calzone et al. 2024; Read and Ward 2018; Thomas et al. 2023). These challenges exacerbate health inequities in low-resource settings where genomic education policies are absent (Katapodi et al. 2023; World Health Organization 2022).

2.2 | Need for Genomics Nurse Educators

The recent "Update to the Essential Genomic Nursing Competencies and Outcome Indicators" reflects consensus that every nurse must have basic genomic competence (Calzone et al. 2024). Organizations such as the International Society for Nurses in Genetics (ISONG), the Intersociety Coordinating Committee for Practitioner Education in Genomics (ISCC-PEG), and the Global Genomics Nursing Alliance (G2NA 2025) are working to enhance nursing genomic literacy. Despite these efforts, inconsistent integration of genomics into nursing curricula and the shortage of genomics-prepared educators remain substantial barriers (Chair et al. 2019; Kronk and Subasic 2025; Kurnat-Thoma et al. 2021).

Genomic science is complex and rapidly evolving, requiring educators with a deep understanding of genomics and effective teaching strategies (Nisselle et al. 2021). The rapid advancements in genomic science necessitate expansion of genomics literacy in leadership, policy, and practice to bridge existing knowledge gaps and ensure nurses can effectively integrate genomics into healthcare (Limoges et al. 2025). To meet this challenge, in December 2019, the ISONG Board of Directors charged the Education Committee with developing a competency framework to guide the credentialing of Genomics Nurse Educators.

3 | Methods

This study aimed to validate the Competency Framework for Genomics Nurse Educators through a structured, multistage approach grounded in best practices for competency framework development (Batt et al. 2021). The focus of this paper is to describe the results of the consensus process. The following sections provide a brief overview of the first two project stages, described in depth in the companion manuscript (Himes et al. 2025), followed by a presentation of the research design for the consensus process (Figure 1).

3.1 | Stage 1: Project Launch

ISONG assembled a steering committee that later served as the research team. During project launch, they engaged with stakeholders to define the project scope, establish aims and objectives, and establish regular feedback loops.

3.2 | Stage 2: Knowledge Synthesis and Study Preparation

The steering committee conducted a comprehensive literature review, synthesized evidence, and engaged stakeholders to inform the initial draft of the framework (Himes et al. 2025). This sequenced approach is consistent with best practices in competency framework development, where generating a structured initial framework precedes expert input (Batt et al. 2021; Keeney et al. 2011).

3.3 | Stage 3: Consensus Process

With the preliminary framework developed and stakeholder input incorporated, the project transitioned to the consensus process, the focus of this manuscript. The consensus process involved testing the framework within the Community of Practice (Batt et al. 2021). The following sections outline the

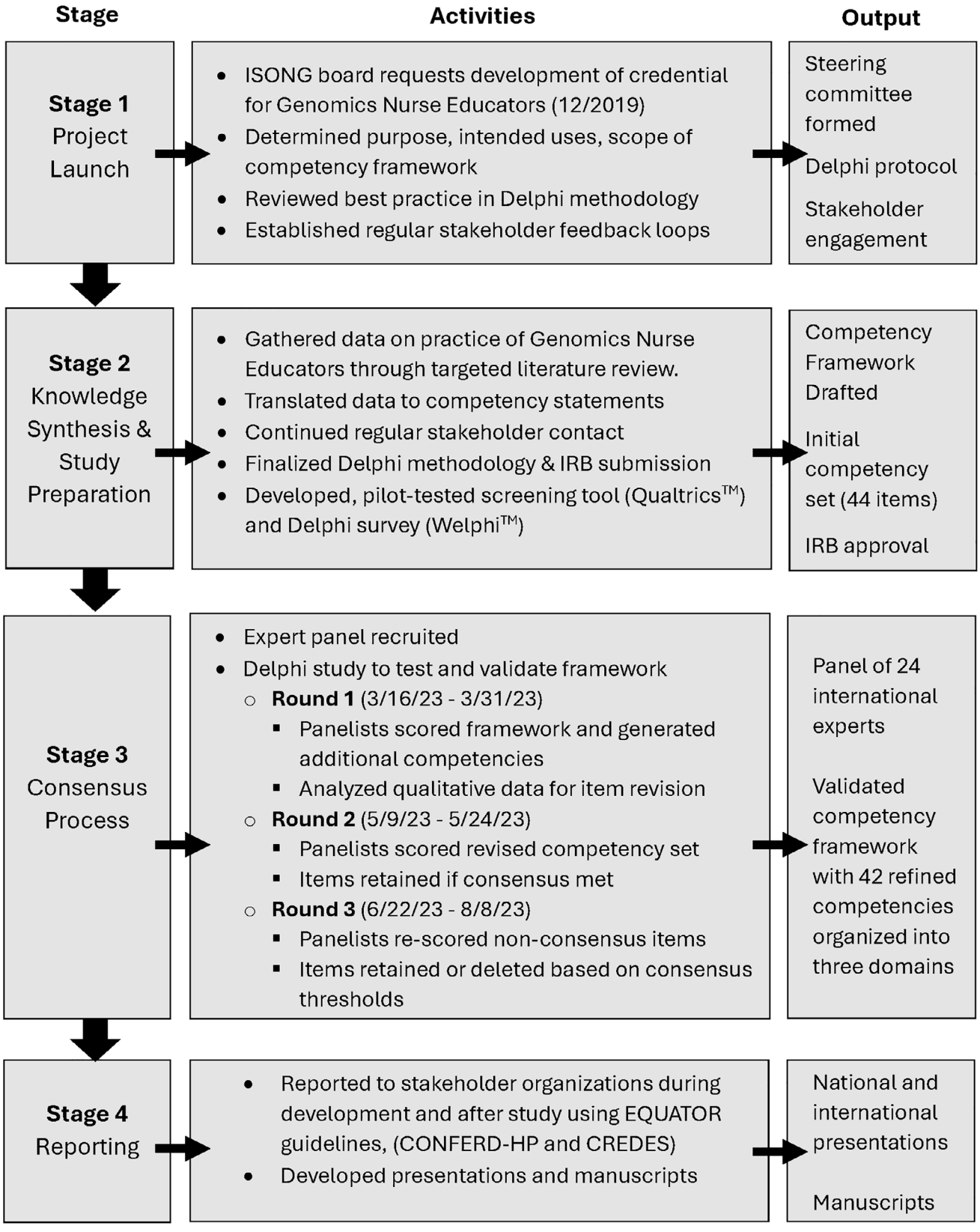

FIGURE 1 | Development and validation process for the Genomics Nurse Educator Competency Framework. This figure outlines the four-stage process used to develop and validate the Competency Framework for Genomics Nurse Educators. The process was led by the steering committee, who also served as the research team. Each stage is shown with its associated activities and outputs, progressing from top to bottom rows, with activities and outcomes displayed from left to right.

research design, theoretical framework, sample recruitment, data collection, and analysis methods.

3.4 | Research Design

The consensus process utilized a modified Delphi method. The Delphi method is suited to contexts where expert consensus is preferred over individual opinion, especially when knowledge is emerging or incomplete (Nasa et al. 2021; Niederberger and Spranger 2020). The electronic Delphi (eDelphi) method facilitated iterative rounds of anonymous, structured feedback from geographically dispersed experts, minimizing social bias and promoting objective consensus (Hasson et al. 2000; Keeney et al. 2011).

The Delphi was considered modified because the process began with a predeveloped draft of competencies rather than generating items from scratch through open-ended questioning (Hasson et al. 2000). This approach allowed the expert panel to focus on refining and validating a structured framework from the outset and is the recommended approach for developing competency frameworks (Batt et al. 2021).

3.5 | Communities of Practice Theoretical Framework

The Communities of Practice theoretical framework (Wenger 1998) provided a foundation for this study, emphasizing how mutual engagement, shared meaning-making, and identity formation shape professional communities (Farnsworth et al. 2016). The international panel of genomics nursing experts embodied a global Community of Practice for Genomics Nurse Educators, collaboratively constructing a competency framework that reflects their real-world experience. Through structured consensus and shared decision-making, panelists contributed to defining their community's professional identity and advancing genomics nursing education.

3.6 | Sample Recruitment and Setting

Recruitment was conducted through:

- Announcements at the ISONG 2022 Congress
- Invitations during a 2022 G2NA-hosted webinar
- Targeted outreach to recognized leaders in genomics nursing education
- Snowball sampling

Inclusion criteria required documented experience in genomics nursing (education, policy, research, and/or practice), verified through a prequalifying questionnaire and CV review. Purposive sampling ensured a diverse panel representing various geographic regions and practice settings.

Panelists participated in the Delphi rounds remotely via Welphi software, which ensured confidentiality, accessibility, and logistical efficiency. Surveys were pilot tested by the steering committee and research assistants before each round to ensure usability.

4 | Delphi Process: Data Collection, Analysis, and Synthesis

Below, we describe panelist preparation and the iterative Delphi process by round, including tasks completed by panelists within rounds and data analysis and synthesis completed by the research team between rounds.

4.1 | Preparation of Panelists

Informing the expert panel is a critical initial step in Delphi studies (Hasson et al. 2000). Panelists were oriented to study goals, framework structure, and expectations for each Delphi round. Introductory materials included a framework summary and participation instructions.

4.1.1 | Round 1: Initial Framework Evaluation

Panelist Tasks Panelists evaluated the overall framework organization, including its domains and competency areas, using a 6-point Likert scale (strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree). Panelists provided qualitative feedback on clarity, relevance, and structure. Additionally, they reviewed a preliminary competency set and suggested new competencies where gaps were identified.

Data Analysis Panelists' agreement ratings for domains and competency areas were calculated using Welphi™ software. Panel-proposed competencies were reviewed for clarity and redundancy. Duplicate competencies were merged or removed, and competencies with unclear wording were revised by the research team to prepare the round 2 questionnaire. Decisions were reached through iterative team discussions, and consensus was required before finalizing any changes. Our approach drew on principles outlined by Nowell et al. (2017).

During comment analysis in both rounds 1 and 2, all six members of the research team engaged in a collaborative and iterative review process. Each researcher independently reviewed and annotated panelist comments ahead of group discussions. Unique perspectives were examined, and assumptions were constructively challenged. For difficult or borderline decisions, the team revisited the analysis on different days to ensure stability of our decisions over time. Key decisions were documented with supporting rationale and panelist quotes. Revisions, merges, and deletions were finalized only after reaching full team agreement.

To maintain panelist engagement and ensure transparency, a questions and answers (Q&A) document summarizing key panelist questions and concerns raised during round 1 was prepared. The document included clarifications, rationale for revisions, and responses from the research team, allowing panelists to make informed decisions in round 2 (Supporting Information Material S1).

4.1.2 | Round 2: Rating Competencies and Consensus Building

Building on insights from round 1, panelists focused on rating-specific competencies and commented on new and revised competencies in round 2.

Panelist Tasks Panelists reviewed the Q&A document and anonymized round 1 comments from fellow panelists and then used the 6-point Likert scale to rate each competency based on two questions:

1. "How strongly do you agree that each competency is RELEVANT to the ROLE of a Genomics Nurse Educator?"
2. "How strongly do you agree that each competency is NECESSARY for ALL Genomics Nurse Educators?"

Data from question 1 informed the consensus for competencies included in the framework. The second question will inform future credentialing criteria and is beyond the scope of this report.

Data Analysis Following similar practices for exploratory Delphi studies in competency framework development, consensus thresholds were not established a priori but were determined during round 2 analysis (Jünger et al. 2017). The research team reviewed panelists' ratings and comments before establishing consensus criteria (see Round 2 Results). Prior Delphi studies have used thresholds ranging from 51% to 95% (Hasson et al. 2000), with competency framework development studies frequently adopting thresholds around 70% (Car et al. 2025; Allaert et al. 2025). However, when response distributions are highly positively skewed, such thresholds risk overinclusion of competencies even when subtle disagreement is present, necessitating reevaluation of consensus criteria mid-study as seen in Ryan et al. (2024). For this reason, and consistent with reporting guidelines, setting thresholds post hoc based on initial voting patterns is justified in exploratory Delphi studies (Jünger et al. 2017). Once determined, our criteria were applied consistently for the remainder of the study. Non-consensus competencies were retained only if disagreement was resolved, with stable disagreement treated as informative of divergent viewpoints.

Comment analysis in Round 2 followed the same collaborative and iterative process described in round 1.

4.1.3 | Round 3: Re-rating Competencies and Final Consensus

Panelist Tasks Panelists reviewed anonymized round 2 feedback (including comments and average ratings for each competency) and their own prior ratings. Panelists then re-rated non-consensus competencies from round 2 and provided additional qualitative feedback to justify their rating.

Data Analysis Competencies meeting consensus thresholds were retained in the final framework. Items failing to achieve consensus to retain were excluded.

4.2 | Ethics and Funding Disclosures

Ethical approval was obtained from the Brigham Young University Institutional Review Board (IRB2022-428). Informed consent was secured from all panelists, and data were anonymized to protect participant identities. Panelists were compensated with $150.00 honorarium, except where institutional policies prohibited compensation. There were no conflicts of interest to disclose among the research team. This study was funded by Brigham Young University College of Nursing and the ISONG Education Committee.

4.3 | Reporting Guidelines

The rigor of competency framework development and validation was supported by adhering to EQUATOR Network (2024) guidelines. The *CONFERD-HP: Recommendations for Reporting Competency Framework Development in Health Professions* (Batt et al. 2023) guided initial competency framework development (Himes et al. 2025). Additionally, the *Guidance on Conducting and Reporting Delphi Studies* (CREDES) (Jünger et al. 2017) informed the design, execution, and reporting of this Delphi study. The completed CREDES checklist is provided online (Supporting Information Material S2).

5 | Results

5.1 | Recruitment Results and Panel Characteristics

From 67 initial contacts, 25 experts were invited, with 24 accepting; 23 completed all three rounds with an attrition rate of 4% (Supporting Information Figure S1). Panelists represented 13 countries (Supporting Information Table S1) and brought a combined 235 years of genomics nursing education experience (Table 1). Their backgrounds reflect expertise in genomics and academic nursing education.

5.2 | Round 1 Results

This round revealed high agreement with initial framework domains and competency areas (Supporting Information Table S2). There were no ratings of disagreement, and the percentage of panelists who rated framework items as "agree" or "strongly agree" ranged from 71% to 100%. The full visual model of the framework is included in a companion manuscript (Himes et al. 2025).

Panelists proposed 22 additional competencies, four of which were removed or merged with another by the steering committee due to duplication, resulting in 18 panel-proposed competencies that were advanced to round 2.

Duplication occurred during round 1 for two primary reasons: panelists could not view each other's suggestions in real time, and competencies were presented sequentially by area. For example, one panelist proposed an item in area 2.1 related to "evaluating learners' progress in genomics" that was deleted

TABLE 1 | Delphi panel experience in genomics and academic nursing education.

Professional experience	Participants			
	n	(%)	*M*	Range
Writing competencies	13	(54.2)		
Curriculum evaluation	13	(54.2)		
Genomic assessment and evaluation	20	(83.3)		
Clinical genomic care	15	(62.5)		
Academic–practice partnership	23	(95.8)		
Genomics publications	22	(91.7)		
Teaching genomics (any setting)	22	(91.7)		
Teaching genomics (academic setting)	19	(79.2)		
Undergraduate only	2	(10.5)		
Graduate only	6	(31.6)		
Both graduate and undergraduate	11	(57.9)		
Years taught in academic nursing			12.3	2–36

Responses to the Qualtrics™ screening survey of the 24 members who participated in the Delphi panel.

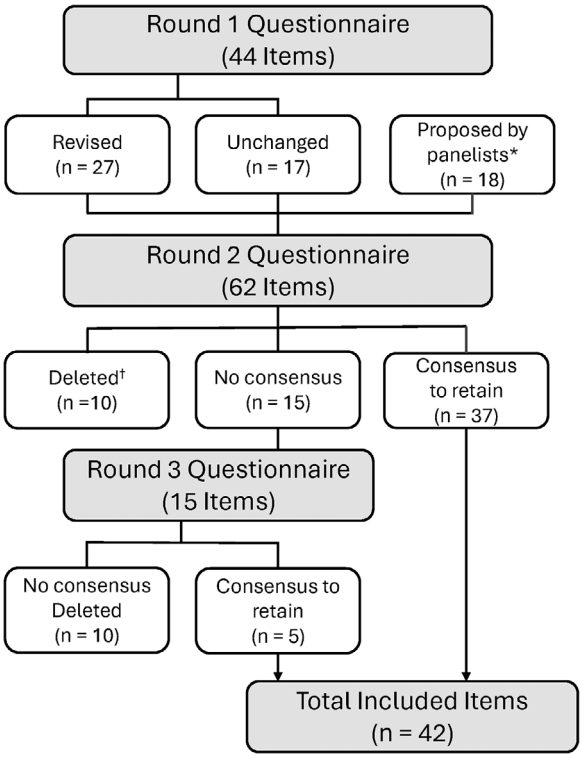

FIGURE 2 | Delphi rounds: consensus process for competency inclusion. This figure illustrates the flow of competencies through three Delphi rounds. Forty-four initial competencies were drafted by the research team. Based on round 1 panelist feedback, 27 were revised and 17 remained unchanged. Panelists proposed an additional 22 competencies, four of which were removed or combined due to redundancy. The remaining 18 were added to the round 2 questionnaire, resulting in 62 competencies rated. Based on panelist feedback, 10 items were deleted for overlap. Fifteen items did not meet consensus and were re-rated in round 3; of these, five reached consensus and were retained in the final framework ($n = 42$).

*Eighteen competencies were panelist-proposed after the removal or combination of 4 duplicate competencies.

†Deletions were based on panelist feedback indicating overlap.

because similar items already covered the concept in area 2.3 (assessment and evaluation strategies). Examples of merging and deletion decision methods are available online (Supporting Information Material S3).

Proposed competencies were removed or merged only when clearly duplicative. If a proposed item had some overlap with other competencies but researchers were conflicted about whether it represented true duplication, the item was retained to obtain panelist feedback in round 2.

Twenty-seven of the 44 steering committee-proposed competencies were revised based on panelists' qualitative feedback. With the addition of 18 panel-proposed competencies, round 1 concluded with 62 competencies (Figure 2).

5.3 | Round 2 Results

Sixty-two competencies from round 1 were rated. We adopted a dual-criteria consensus threshold, defining each criterion as follows:

- Unanimous Agreement (UA): 100% agreement, including "somewhat agree," "agree," or "strongly agree."
- Strong Majority Agreement (SMA): More than 80% of panelists selecting "agree" or "strongly agree," with fewer than 10% selecting any level of disagreement, "somewhat disagree," "disagree," or "strongly disagree."

These criteria were discussed and finalized by the full six-member research team after examining response distributions and panelist comments from round 2. A threshold of 70% agreement—as used in other competency framework Delphi studies (Car et al. 2025; Allaert et al. 2025)—would have resulted in inclusion of all competencies after a single round, due to strong positive skew. Conversely, requiring 100% agreement would have allowed a small minority to block well-supported items, while using 80% agreement at upper levels risked eliminating valuable competencies with no disagreement. The dual-criteria approach was implemented to mitigate these risks.

UA allows broad inclusion when there was 100% conceptual endorsement, even if some panelists rated only "somewhat agree." Comments associated with "somewhat agree" ratings typically reflected a need for clarification rather than substantive disagreement. SMA, by contrast, ensured that items with the strongest support were not excluded due to minor dissent—at any level of disagreement.

Of the 62 competencies rated, 37 met consensus criteria and were retained; 15 did not meet criteria, necessitating their re-rating in round 3, and 10 items were deleted or merged because panelists identified them as duplicative (Figure 2; Supporting Information Table S3). Round 2 was the first opportunity panelists had to review the full list of competencies—including those added by fellow panelists—side-by-side. Most deleted or merged items had previously been identified in round 1 as potentially overlapping but were retained to seek panelist feedback in round 2. During this round, panelist comments confirmed an overlap across some items, and these competencies were merged or removed accordingly (Supporting Information Material S3). Because panelists' ratings were for relevance only, written feedback was essential in identifying which competencies were viewed as overlapping. It is not uncommon to have competencies revised based on both panel comments and research team interpretation, especially where the researchers are content experts as well (Allaert et al. 2025). Without merges and deletions, the final competency framework would have included several highly rated but overlapping competencies. Qualitative comments also informed minor edits and clarifications to retained items.

5.4 | Round 3 Results

Among the 15 items re-rated in round 3, five achieved consensus and were retained. The remaining 10 did not achieve consensus and were deleted (Supporting Information Table S4). Data collection concluded after three rounds, resulting in 42 competencies organized into three domains (Figure 2). Overall, three competencies were retained by UA, 25 by SMA, and 14 met both UA and SMA criteria. The final set of validated competencies is available online (Supporting Information Material S4).

6 | Discussion

The Competency Framework for Genomics Nurse Educators was systematically and rigorously validated through an international Delphi study. The competency framework encompasses three key domains, including educational foundations, genomics pedagogy, and contributions to the discipline through leadership and engagement with academic–practice partnerships. Study limitations and mitigation strategies, external validation reporting mechanisms, and position of our findings within the broader landscape of nursing education are detailed below.

6.1 | Limitations

While our study established a globally relevant framework, the panel may not represent the entire international community of practice, as not all countries participated. Nevertheless, contributions from panelists across 13 countries provided robust geographic representation. Future efforts will broaden the framework's scope and global perspective by including underrepresented regions.

A known limitation of the Delphi method is the absence of real-time dialogue among panelists, requiring them to wait until the next round to see others' responses. While round delays limit immediate feedback, the iterative structured approach promotes deliberate reflection and independent decision-making (Keeney et al. 2011).

The cognitive load of reviewing extensive materials and peer feedback may have posed challenges for panelists. Despite this, attrition was remarkably low at 4%, well below the <30% threshold for methodological rigor (Keeney et al. 2011), outperforming typical eDelphi study attrition rates of 5% to 28% (Toronto 2017). Our 96% retention rate through all three rounds enhances the credibility and robustness of our findings (Supporting Information Figure S1).

Quantitative analysis of Delphi studies is complicated by the lack of standardized consensus thresholds for Delphi studies in the literature (Hasson et al. 2000) and the unpredictable nature of response distributions in exploratory studies. To address this, we employed a dual-criteria consensus approach—prioritizing disagreement over agreement—set after the first round of ratings, ensuring only well-endorsed competencies were retained.

Finally, qualitative data interpretation carries an element of subjectivity. We enhanced trustworthiness through group reflexivity—encouraging critical self-awareness among researchers. Systematic documentation helped to maintain transparency, and meticulous decision-tracking provided a clear audit trail for data interpretation (Nowell et al. 2017).

6.2 | Reporting for External Validation

The credibility and applicability of the framework were supported through stakeholder review and validation. By sharing our processes, progress, and findings with key professional organizations, we aligned the framework with the needs of genomics educators worldwide—a critical step in framework development (Batt et al. 2021). See Figure 1.

We engaged ISONG stakeholders through multiple channels:

- Education Committee reports—Monthly updates and full report upon completion.
- Executive Board reports—Quarterly briefings.
- General membership updates—Annual written reports by the Education Committee, presented at ISONG business meetings (2020–2024).
- ISONG Annual Congress Presentations—(Rhode Island, USA, 2021; San Diego, USA, 2024).

Organizational feedback through these regularly scheduled engagements was instrumental in refining the framework during the initial drafting process and strengthened its practical applicability across diverse settings and healthcare systems. Our framework also reached a wider audience through presentations at:

- Canadian Nurses Association Conference (Montreal, 2023).
- Global Genomics Nursing Alliance (G2NA) Quarterly Meetings (2022 and 2024).

- ISCC–PEG Nursing Genomics Workgroup meetings (2023–2025)
- American Association of Colleges of Nursing (AACN) Doctoral Education Conference (San Diego, USA, 2025).
- International Genomics Education and Training Summit (Athens, Greece, 2025).
- Sigma Theta Tau International Honor Society of Nursing Biennial Conference (Seattle, USA, 2025).

These varied dissemination strategies engaged key stakeholders and fostered widespread awareness and endorsement of the framework, increasing potential influence on global genomics nursing education initiatives.

6.3 | Positioning Within the Field

Our study addresses a clearly recognized need to develop genomics educators to fill critical gaps in genomics nursing expertise. The AACN (2019) emphasized the need for faculty to cultivate specialized expertise, as no single educator can master knowledge of all areas of healthcare. Our stakeholders agree that talented genomics nurse educators foster robust genomic nursing education that can promote further genomics integration into all areas of nursing practice.

The precedence for competency development through consensus among members of the professional community is well-established. Consensus methodologies ensure that resulting frameworks reflect a range of expert input grounded in shared values of the professionals in healthcare communities (Myers et al. 2022; Nasa et al. 2021). The development of competency frameworks plays a critical role in standardizing education, defining professional roles, and ensuring high standards in specialized fields. Our competency framework was similar in scope and areas of focus to other competency frameworks developed for nurse educators in specialty teaching areas and with genomics competencies for health professionals (Tognetto et al. 2019).

In recent years, the development of specialized competency frameworks within academic nursing education has gained momentum, reflecting a broader movement toward recognizing and formalizing distinct areas of faculty expertise. For example, Ye et al. (2022) introduced a comprehensive set of core competencies for clinical nurse educators in China, encompassing domains such as clinical teaching proficiency, advanced nursing skills, leadership, and research innovation. Similarly, Zafošnik et al. (2024) developed competencies tailored for instructors engaged in simulation-based healthcare training, addressing both foundational and advanced instructional skills. These initiatives underscore growing international recognition of the value of delineating specific competencies to enhance educational quality and efficacy.

The Genomics Nurse Educator Competency Framework aligns with this movement by addressing the unique challenges and requirements of genomics education within nursing. Genomics, like clinical teaching and simulation-based training, demands a specialized set of teaching strategies and evaluative measures to effectively integrate complex genetic information into nursing practice. By establishing clear competencies for genomics nurse educators, we aim to standardize educational approaches, ensure high-quality instruction, and ultimately improve patient care outcomes through precision health initiatives. Growing international recognition of the need for specialized frameworks in nursing education positions the Genomics Nurse Educator Competency Framework within this broader movement.

6.4 | Future Work and Research

The Competency Framework for Genomics Nurse Educators provides a solid foundation for developing an international portfolio-based credential. A credential with established benchmarks will enable educators to demonstrate genomics expertise across domains. Specialty credentialing offers advantages, including improved patient outcomes, professional growth, and organizational support (Whitehead et al. 2019). Portfolio-based approaches are particularly effective for evaluating professional competence as evidenced by their use with clinically practicing nurses in genetics (Cook et al. 2003; Nurse Portfolio Credentialing Commission 2025).

Our framework, combined with a credentialing initiative, aims to elevate education quality, promote faculty expertise, and bolster academic–practice partnerships—ultimately contributing to workforce development and precision healthcare delivery.

Future work will focus on evaluating, updating, and maintaining the framework. Best practice guidelines suggest reviewing and updating frameworks every five years to reflect contemporary practice changes and maintain relevance (Batt et al. 2021). Sustained collaboration among academic and clinical stakeholders—as well as intentional engagement with regions underrepresented in the framework's initial validation—will be crucial to broadening the framework's global perspective and ensuring a dynamic response to evolving practice needs. Future research will explore pedagogical innovations in nursing genomics, outcomes of academic–practice partnerships, and the framework's impact on education, credentialing, and global collaboration. These collaborations will support international standards for genomic education and workforce genomic literacy in diverse educational contexts.

7 | Conclusion

This study validated the Competency Framework for Genomics Nurse Educators. The framework offers a structured guide for professional development, facilitating the integration of genomics into nursing curricula and amplifying nursing education's global influence. By establishing clear competencies, this framework supports the specialization of Genomics Nurse Educators, positioning them as leaders and change agents in both academic and clinical settings. The full set of competencies, organized by domain and area, is available online (Supporting Information Material S4). Future initiatives will focus on credentialing and advancing evidence-based teaching practices in genomics nursing education. Ultimately, by equipping Genomics Nurse Educators with the competencies needed to

lead and innovate, this framework contributes to the broader vision of precision health—where nurses play a pivotal role in delivering personalized, genomics-informed care that improves health outcomes globally.

7.1 | Implications for Nursing Practice

The Genomics Nurse Educator Competency Framework equips educators to enhance genomic literacy of the nursing workforce. Implementing this framework supports quality genomics education, enabling nurses to provide genomics-informed care while recognizing Genomics Nurse Educators for their specialized expertise and unique contributions to healthcare. The framework promotes faculty development pathways, fostering career advancement and expertise in teaching genomics. Moreover, it encourages collaboration between education and practice, enhancing learner confidence and organizational support for genomics nursing education. Combined, these effects will prepare nurses to deliver precision healthcare.

7.2 | Implications for Nursing and Health Policy

The Competency Framework for Genomics Nurse Educators has wide-reaching implications for nursing policy. Detailing essential competencies for nurse educators who specialize in genomics offers a model for promoting specialized skill sets among academic nurse educators. The advancement of nursing genomic literacy has the potential to inform policy development to incorporate precision health as standard of care in clinical, community, national, and international settings.

This framework establishes a foundation for genomics nursing education as a distinct nursing specialty, as recognized by accreditation and professional standards (Accreditation Board for Specialty Nursing Certification 2020; American Nurses Association 2024). Specialty designation lays the groundwork for formal credentialing. A portfolio-based credential for Genomics Nurse Educators will support career advancement and maintain high standards for teaching genomics nursing globally. Increasing the number of faculty with genomic literacy will shape policies and priorities in nursing education, influencing curricula and faculty development (Cao et al. 2025). The framework offers a structured approach to credential development, reinforcing teaching excellence and informing policies that support standardized genomics education.

All areas of healthcare education face the challenge of integrating genomics into both classroom and clinical content, and nursing is no exception. This challenge underscores the need for interdisciplinary and international collaboration beyond the nursing profession. In many academic environments, educators with genomics expertise are scarce, limiting mentorship opportunities and shared learning among faculty. Professional organizations can address these gaps by creating formal programs that connect educators across disciplines, fostering a global network for knowledge-sharing. Building on the principles of this framework, international nursing organizations can implement policies and initiatives that promote global collaboration in genomics education, while also strengthening local and regional efforts to ensure equitable access. Recognizing the importance of academic–practice partnerships, professional organizations can facilitate connections between clinicians and classroom educators, ensuring a tangible connection between education and practice. Such concerted efforts will advance genomics education on a worldwide scale, ultimately enhancing genomic care through a global community of practice.

Author Contributions

Conceptualization, study design, data collection, data analysis: All authors. Study supervision: DOH and SHD. Writing–original draft preparation: All authors. Writing–critical revisions for important intellectual content: All authors. Visualizations: DOH and SHD. Critical revisions for important intellectual content: All authors. Funding acquisition: All authors.

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Conflicts of Interest

There are no conflicts of interest to disclose.

References

Abad, P. J. B., and A. L. D. Sur. 2022. "Nursing Engagement in Genetics and Genomics: A Developing Country's Perspective." *International Nursing Review* 69: 559–565. https://doi.org/10.1111/inr.12751.

Accreditation Board for Specialty Nursing Certification. 2020. Accreditation Standards for Portfolio Assessment Certification Programs. https://absnc.org/certification/accreditation-standards-portfolio-assessment-certification.

Allaert, E., M. Robbrecht, T. Hamerlynck, and S. Weyers. 2025. "Development of a Competency Framework for Postgraduate Training in Obstetrics and Gynaecology Using a Delphi Study." *International Journal of Medical Education* 16: 21–35. https://doi10.5116/ijme.679e.0509.

American Association of Colleges of Nursing. 2019. AACN's Vision for Academic Nursing. https://www.aacnnursing.org/Portals/42/News/White-Papers/Vision-Academic-Nursing.pdf.

American Nurses Association. 2024. "American Nurses Association Recognition of a Nursing Specialty, Approval of a Specialty Nursing Scope of Practice Statement, Acknowledgement of Specialty Nursing Standards of Practice, and Affirmation of Focused Practice Competencies." https://www.nursingworld.org/globalassets/practiceandpolicy/scope-of-practice/3sc-booklet-2024-05-16-bod-approved.pdf.

Batt, A., B. Williams, J. Rich, and W. Tavares. 2021. "A Six-Step Model for Developing Competency Frameworks in the Healthcare Professions." *Frontiers in Medicine* 8: 789828. https://doi.org/10.3389/fmed.2021.789828.

Batt, A. M., W. Tavares, T. Horsley, et al. 2023. "CONFERD-HP: Recommendations for Reporting Competency Framework Development in Health Professions." *British Journal of Surgery* 110, no. 2: 233–241. https://doi.org/10.1093/bjs/znac394.

Calzone, K. A., L. Stokes, C. Peterson, and L. Badzek. 2024. "Update to the Essential Genomic Nursing Competencies and Outcome Indicators." *Journal of Nursing Scholarship* 56, no. 5: 729–741. https://doi.org/10.1111/jnu.12993.

Camak, D. J. 2016. "Increasing Importance of Genetics in Nursing." *Nurse Education Today* 44: 86–91. https://doi.org/10.1016/j.nedt.2016.05.018.

Cao, Y., Y. Gao, K. Chappell, and W. Zhou. 2025. "Factors Affecting Nurses' Genetic Nursing Competency: A Systematic Review." *Nurse Education in Practice* 84: 104304. https://doi.org/10.1016/j.nepr.2025.104304.

Car, J., Q. C. Ong, T. E. Fox, et al. 2025. "The Digital Health Competencies in Medical Education Framework: An International Consensus Statement Based on a Delphi Study." *JAMA Network Open* 8, no. 1: e2453131. https://doi.org10.1001/jamanetworkopen.2024.53131.

Chair, S. Y., M. M. Y. Waye, K. Calzone, and C. W. H. Chan. 2019. "Genomics Education in Nursing in Hong Kong, Taiwan and Mainland China." *International Nursing Review* 66, no. 4: 459–466. https://doi.org/10.1111/inr.12537.

Consensus Panel on Genetic/Genomic Nursing Competencies. 2009. *Essentials of Genetic and Genomic Nursing: Competencies, Curricula Guidelines, and Outcome Indicators*. 2nd ed. American Nurses Association. https://www.genome.gov/Pages/Careers/HealthProfessionalEducation/geneticscompetency.pdf.

Cook, S. S., R. Kase, L. Middelton, and R. B. Monsen. 2003. "Portfolio Evaluation for Professional Competence: Credentialing in Genetics for Nurses." *Journal of Professional Nursing* 19, no. 2: 85–90. https://doi.org/10.1053/jpnu.2003.15.

EQUATOR Network. 2024. Enhancing the Quality and Transparency of Health Research. https://www.equator-network.org/.

Farnsworth, V., I. Kleanthous, and E. Wenger-Trayner. 2016. "Communities of Practice as a Social Theory of Learning: A Conversation With Etienne Wenger." *British Journal of Educational Studies* 64, no. 2: 139–160. https://doi.org/10.1080/00071005.2015.1133799.

Fu, M. R., E. Kurnat-Thoma, A. Starkweather, et al. 2020. "Precision Health: A Nursing Perspective." *International Journal of Nursing Sciences* 7, no. 1: 5–12. https://doi.org/10.1016/j.ijnss.2019.12.008.

Global Genomics Nursing Alliance (G2NA). 2025. Home Page. https://www.g2na.org/index.php.

Genomics England. 2024. 100,000 Genomes Project. NHS England. https://www.genomicsengland.co.uk/initiatives/100000-genomes-project.

Hasson, F., S. Keeney, and H. McKenna. 2000. "Research Guidelines for the Delphi Survey Technique." *Journal of Advanced Nursing* 32, no. 4: 1008–1015. https://www.ncbi.nlm.nih.gov/pubmed/11095242.

Himes, D. O., J. R. Dungan, S. Dewell, S. H. Davis, L. D. Ward, and R. F. Lucas. 2025. "Competency Framework Development for Genomics Nurse Educators: Defining a Specialty Role in Academic Nursing Education." *Nurse Educator* 50, no. 5: 253–259. https://doi.org/10.1097/NNE.0000000000001947.

Jünger, S., S. A. Payne, J. Brine, L. Radbruch, and S. G. Brearley. 2017. "Guidance on Conducting and Reporting Delphi Studies (CREDES) in Palliative Care: Recommendations Based on a Methodological Systematic Review." *Palliative Medicine* 31, no. 8: 684–706. https://doi.org/10.1177/0269216317690685.

Katapodi, M. C., C. Pedrazzani, S. Barnoy, et al. 2023. "ACCESS: An Empirically-Based Framework Developed by the International Nursing CASCADE Consortium to Address Genomic Disparities Through the Nursing Workforce." *Frontiers in Genetics* 14: 1337366. https://doi.org/10.3389/fgene.2023.1337366.

Keeney, S., F. Hasson, and H. McKenna. 2011. *The Delphi Technique in Nursing and Health Research*. Wiley-Blackwell.

Kronk, R., and K. Subasic. 2025. "The Parallels, Pearls, and Perils of Health and Genomic Literacy." *Nursing Clinics of North America* 60, no. 2: 229–241. https://doi.org/10.1016/j.cnur.2024.12.008.

Kurnat-Thoma, E., M. R. Fu, W. A. Henderson, et al. 2021. "Current Status and Future Directions of U.S. genomic Nursing Health Care Policy." *Nursing Outlook* 69, no. 3: 471–488. https://doi.org/10.1016/j.outlook.2020.12.006.

Limoges, J., R. Puddester, A. Gretchev, et al. 2025. "Building a Genomics-Informed Nursing Workforce: Recommendations for Oncology Nursing Practice and Beyond." *Current Oncology* 32, no. 1: 14. https://doi.org/10.3390/curroncol32010014.

Myers, K., C. Bilyeu, K. Covington, and A. Sharp. 2022. "Clinical Teaching Competencies in Physical Therapist Education: A Modified Delphi Study." *PTJ: Physical Therapy & Rehabilitation Journal* 102, no. 7: 1–12. https://doi.org/10.1093/ptj/pzac063.

Nasa, P., R. Jain, and D. Juneja. 2021. "Delphi Methodology in Healthcare Research: How to Decide Its Appropriateness." *World Journal of Methodology* 11, no. 4: 116–129. https://doi.org/10.5662/wjm.v11.i4.116.

National Institutes of Health. 2025. "All of Us Research Hub: Data Snapshots." https://www.researchallofus.org/data-tools/data-snapshots/.

Niederberger, M., and J. Spranger. 2020. "Delphi Technique in Health Sciences: A Map." *Frontiers in Public Health* 8: 457. https://www.frontiersin.org/article/10.3389/fpubh.2020.00457.

Nisselle, A., M. Janinski, M. Martyn, et al. 2021. "Ensuring Best Practice in Genomics Education and Evaluation: Reporting Item Standards for Education and Its Evaluation in Genomics (RISE2 Genomics)." *Genetics in Medicine* 23, no. 7: 1356–1365. https://doi.org/10.1038/s41436-021-01140-x.

Nowell, L. S., J. M. Norris, D. E. White, and N. J. Moules. 2017. "Thematic Analysis: Striving to Meet the Trustworthiness Criteria." *International Journal of Qualitative Methods* 16, no. 1. https://doi.org/10.1177/1609406917733847.

Nurse Portfolio Credentialing Commission (NPCC) 2025. "Awarding Nursing Excellence in Genomics." https://www.nurseportfolio.org/.

Read, C. Y., and L. D. Ward. 2018. "Misconceptions About Genomics Among Nursing Faculty and Students." *Nurse Educator* 43, no. 4: 196–200. https://doi.org/10.1097/NNE.0000000000000444.

Ryan, C., R. Cant, C. Ossenberg, D. Ahchay, L. Hughes, and F. Bogossian. 2024. "Competency Domains for Registered Nurse Preceptor Professional Development: Evidence From a Modified e-Delphi Study." *Nurse Education in Practice* 77: 103952. https://doi.org/10.1016/j.nepr.2024.103952.

Thomas, J., J. Keels, K. A. Calzone, et al. 2023. "Current state of Genomics in Nursing: A Scoping Review of Healthcare Provider Oriented (Clinical and Educational) Outcomes (2012–2022)." *Genes* 14, no. 11: 2013. https://doi.org/10.3390/genes14112013.

Tognetto, A., M. B. Michelazzo, W. Ricciardi, A. Federici, and S. Boccia. 2019. "Core Competencies in Genetics for Healthcare Professionals: Results From a Literature Review and a Delphi Method." *BMC Medical Education* 19, no. 1: 19. https://doi.org/10.1186/s12909-019-1456-7.

Toronto, C. 2017. "Considerations When Conducting e-Delphi Research: A Case Study." *Nurse Researcher* 25, no. 1: 10–15. https://doi.org/10.7748/nr.2017.e1498.

U.S. Department of Veterans Affairs. 2023. "MVP Hits 1 Million: VA National Research Program Enrolls Historic One Millionth Veteran." https://www.research.va.gov/currents/1123-MVP-Hits-Million.cfm#:~:text=November%2015%2C%202023,data%20for%20this%20many%20participants.

Wenger, E. 1998. *Communities of Practice: Learning, Meaning and Identity*. Cambridge University Press.

Whitehead, L., M. Ghosh, D. K. Walker, D. Bloxsome, C. Vafeas, and A. Wilkinson. 2019. "The Relationship Between Specialty Nurse Certification and Patient, Nurse and Organizational Outcomes: A Systematic Review." *International Journal of Nursing Studies* 93: 1–11. https://doi.org/10.1016/j.ijnurstu.2019.02.001.

World Health Organization. 2022. Accelerating Access to Genomics for Global Health: Promotion, Implementation, Collaboration, and Ethical, Legal, and Social Issues. https://www.who.int/publications/i/item/9789240052857.

Ye, J., W. Tao, L. Yang, Y. Xu, N. Zhou, and J. Wang. 2022. "Developing Core Competencies for Clinical Nurse Educators: An e-Delphi Study." *Nurse Education Today* 109: 105217. https://doi.org/10.1016/j.nedt.2021.105217.

Zafošnik, U., V. Cerovečki, N. Stojnić, A. P. Belec, and Z. Klemenc-Ketiš. 2024. "Developing a Competency Framework for Training With Simulations in Healthcare: A Qualitative Study." *BMC Medical Education* 24, no. 1: 180. https://doi.org/10.1186/s12909-024-05139-1.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Flow Diagram S1: Expert Panel Recruitment, Selection, and Round Participation **Supporting File 1:** Q&A Presented to Panel at Round 2 **Supporting File 2:** Recommendation for the conducting and reporting of Delphi Studies (CREDES) **Supporting File 3:** Examples of Merging and Deletion Decisions with Supporting Data **Supporting File 4:** Validated Competencies for Genomics Nurse Educators **Table S1:** Global Representation of Delphi Panel **Table S2:** Ratings of Domains and Areas: Competency Framework for Genomics Nurse Educators **Table S3:** Ratings Round 2 **Table S4:** Ratings Round 3