

# Experience with Online ELSI Genetics Training for Medical Students

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**Relevance:** Existing curricula in medical schools does not adequately cover clinical aspects of the ELSI of genetics. We sought to create an online supplement.

**Purpose:** With support from the NIH/National Human Genome Research Institute (Grant # R25HG02266) we developed a 6 module online ELSI curriculum. The curriculum was developed based consultant experts, best practice guidelines, and recommendations of organizations including AAMC, NCHPEG and APHMG. Modules included:

- 1) Pediatrics: A family study of a child with multiple congenital anomalies,
- 2) Newborn Screening,
- 3) Prenatal Genetic Testing,
- 4) Presymptomatic Testing: Genetic Testing for Breast and Ovarian Cancer Risk,
- 5) Complex Inheritance: Genetics of Common Complex Disorders, and
- 6) Issues in Genetic Medical Research: A Case Study.

**Methods:** Eight (8) different medical schools and 1765 students took the online ELSI genetics modules as supplemental course materials. Each module included its own pre and post survey. Only data for users who completed the pre- and post-test assessments were included in the data analysis.

Subjects took knowledge pre- and post-test assessments. Although the user was allowed to "re-take" the post-test until they received a passing score, data analysis was conducted on the post-test score from the first "take." Seventy percent (70%) was the benchmark passing score for each individual post-test.

Subjects self-assessed attitude, self-efficacy and intended behavior after each of the modules by rating a statement on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) in a retrospective pre-post design. This design prompted the user to rate an item on the level of agreement before participating in the course and after participating in the course. These and all other rating scale items were presented with an "N/A" option. The attitude item asked the learner to rate his or her role as a health care professional in dealing with issues addressed in the modules. The self-efficacy item was tied to learning objectives for each module. The intended behavior item rated whether the student plans on incorporating the ELSI principles learned from the modules into clinical practice.

Users also rated the module's ability to achieve each of its learning objectives. Users rated on a scale from 1 to 5 how well each objective was met, with only the end points 1=Completely Failed to Meet Objective and 5=Completely Met Objective defined.

Satisfaction with the learning experience was assessed using the Clinical Tools Satisfaction Scale, a standard assessment tool developed by Clinical Tools. Satisfaction was rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

**Results:** The increases in knowledge across all modules was statistically significant ( $p < 0.05$ ) and very significant ( $p < 0.001$ ) in all modules except the "Issues in Medical Genetics Research" module which only had 15 respondents. Similarly with the exception of the research module, each module's average post-test score met or exceeded 70%. The Prenatal Genetic Testing and Newborn Screening modules showed the largest effect.

- 1) Changes in attitude, self-efficacy, and intended behaviors from pre to post modules were found statistically significant for each module ( $p < 0.05$ ) except for the intended behavior item for the research module.
- 2) Average scores on ratings of learning objective success ranged from 4.08 to 4.26 for all six modules. Thus on average learners agreed or strongly agreed that the learning objectives were met.
- 3) Average satisfaction scores for the six modules were high ( $\geq 4$ ). Users appear to be quite satisfied with the learning experience from these modules.

**Discussion:** Online training can be successfully deployed to augment genetics education in medical school. Online training in ELSI topics achieves changes in knowledge, attitude and behavior. It meets the learning objectives of an established curriculum and is well received. As the curricular needs of medical school expand to address changes and developments in medicine, online education is one way that genetics education can be efficiently delivered to students to ensure they have proper training in genetics.

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Genetics in Pediatrics: A Family Study of a Child With Multiple Congenital Anomalies

Congenital Anomalies  
Case Presentation: Meet Susan  
Classification of Anomalies  
Etiology of Anomalies

## Congenital Anomalies

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## Congenital Anomalies

Birth defects, or congenital anomalies, pose a considerable public health problem. Collectively, congenital anomalies are a leading cause of neonatal death and disease worldwide (WHO 2014). Congenital anomalies are caused by underlying genetic factors, the environment, or a combination of both factors (World Atlas 2003).

Congenital anomalies can be subdivided into 2 distinct categories: major and minor. Major congenital anomalies are defects present at birth that have a significant impact on body

