Jul 24th, 11:15 AM - 12:15 PM

Using Open Access Resources in Data Literacy Instruction: Renewing the IL Curriculum by Aligning It with Changing Needs

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Using open access resources in data literacy instruction: renewing the IL curriculum by aligning it with changing needs

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LIWest 2014-Portland

LIWest 2014-Portland

What we did

Reinvent information literacy (IL) program – integrate genetics & biochemistry content

Course-integrated library/Lab project
Biology 311 (October) - Biochemistry 393 (February)

Investigate the molecular & structural basis of inherited diseases using disciplinary data

550 students per class
24 lab sections
10 IL workshops in library classrooms

Inquiry-based exercises

BIOL 311

- *Molecular* basis of inherited diseases
- Student-directed analysis of molecular genetic causes and treatments for a specific inherited disease

Poster

- Students present results of their analysis to peers through a poster presentation at end of term – 6% of final grade

BCEM 393

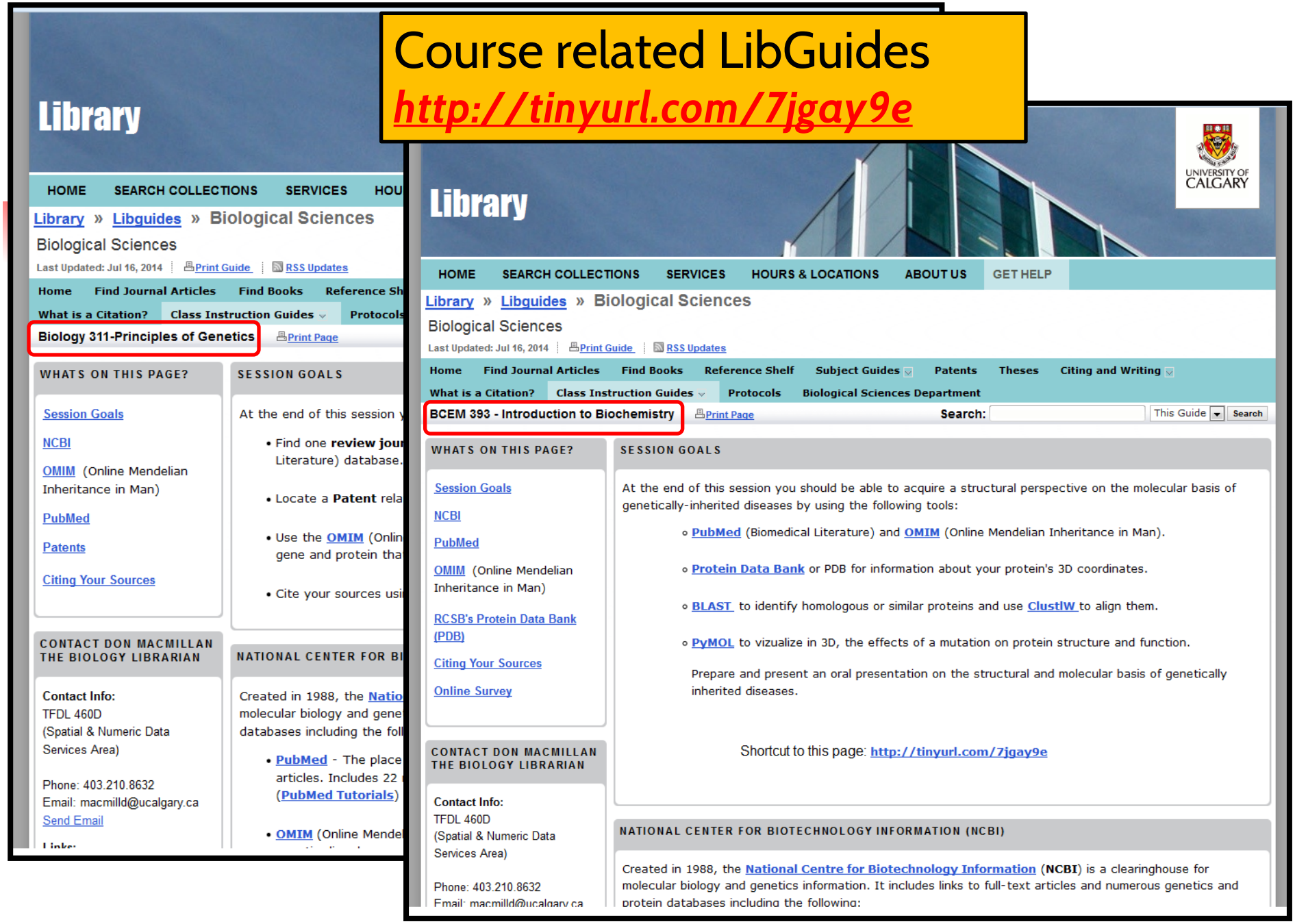
- *Structural* perspective on molecular basis of inherited diseases
- Student-directed analysis of mutations in proteins leading to a specific inherited disease

Poster

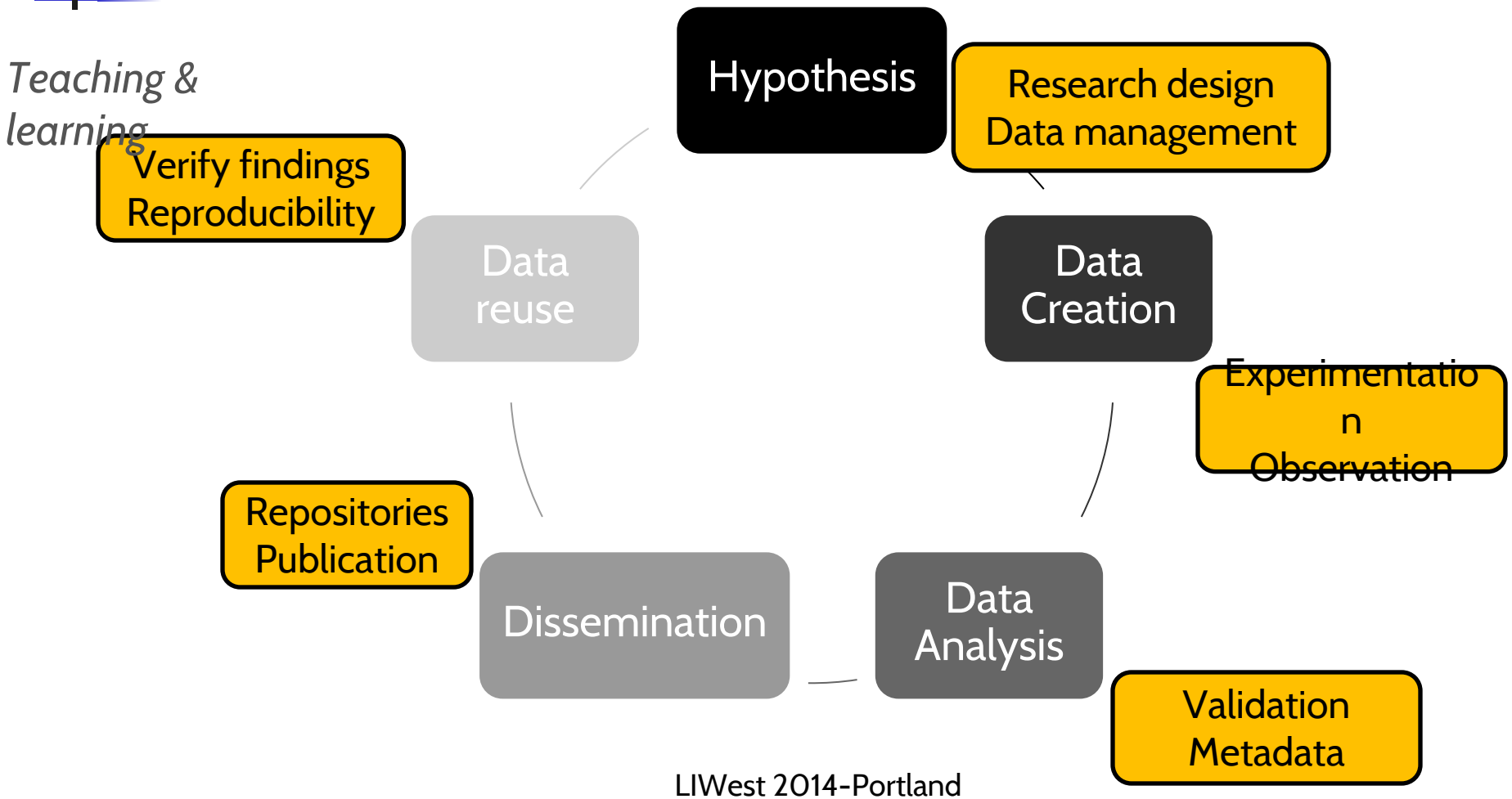
- Students present results of molecular visualization analysis to peers through a poster presentation at end of term – 6% of final grade

Course related LibGuides

http://tinyurl.com/7jgay9e



Scientific Data Life Cycle



Why Data Literacy?

Data-intensive disciplines – robust infrastructure - unique research outcomes

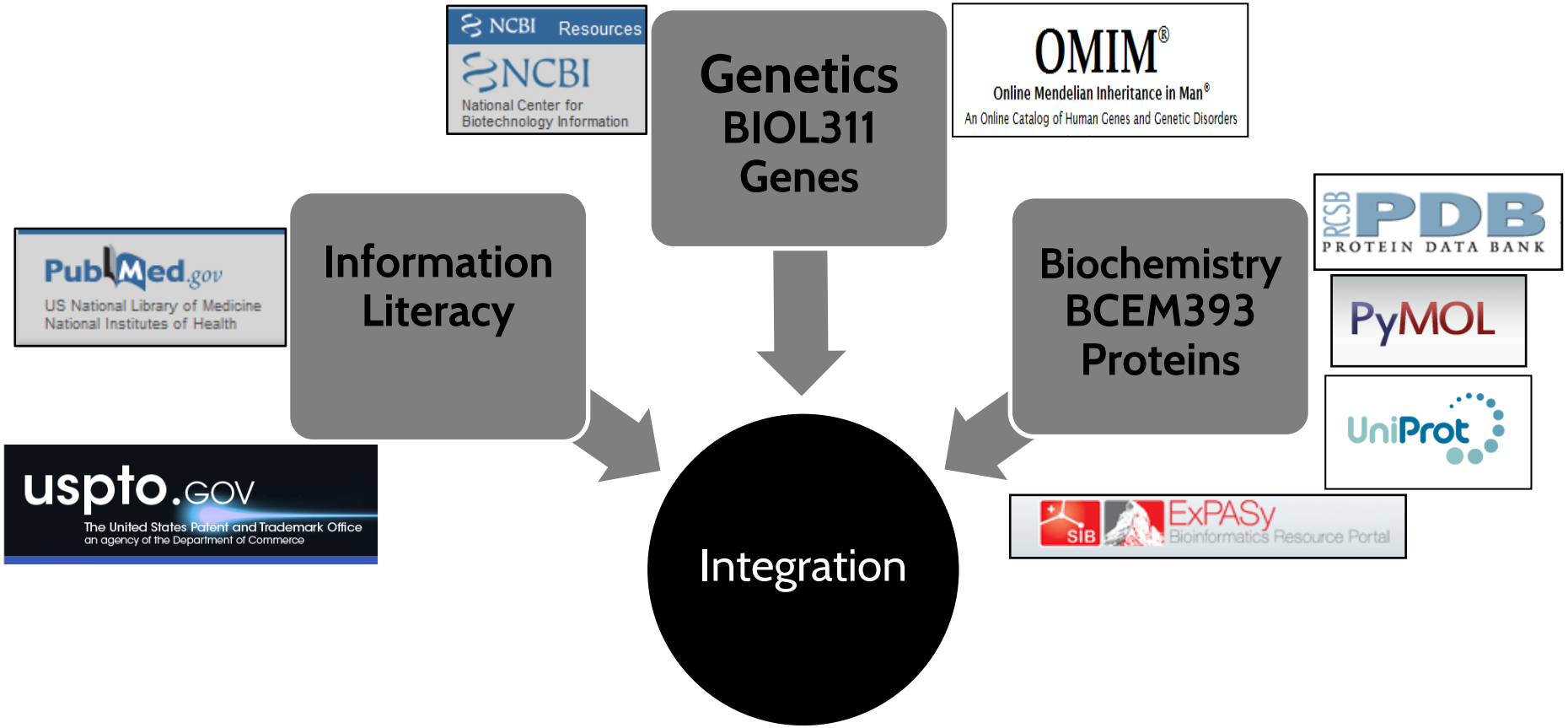
Bioinformatics tools facilitates discovery & analysis of life sciences data

Students conduct research using "real-world" solutions using domain repositories

Librarian re-skilling – enhance our data competencies, domain expertise & relevance

Bioinformatics

Tools for collection & analysis of complex biological data



What is Bioinformatics data?

- Your handout is a sample page from the Protein Data Bank (PDB)

  Data repository of 3D protein structural information

- What if we asked students "What is the important info on this page"

Protein Data Bank (PDB)

RCSB PDB PROTEIN DATA BANK | PDB-101

A MEMBER OF THE PDB | EMDataBank
An Information Portal to Biological Macromolecular Structures
2014 at 5 PM PDT there are 101539 Structures | PDB Statistics

Search | Advanced | Browse

Everything | Author | Macromolecule | Sequence | Ligand

e.g., PDB ID, molecule name, author

Search History , Previous Results

PDB-101 Hide
- Structural View of Biology
- Understanding PDB Data
- Molecule of the Month
- Educational Resources
- Author Profiles

MyPDB Hide
- Login to your Account
- Register a New Account
- MyPDB Help Page

Home Hide
- News & Publications
- Usage/Reference Policies
- Deposition Policies
- Website FAQ
- Deposition FAQ
- Contact Us
- About Us
- Careers
- External Links
- New Website Features

Deposition Hide
- All Deposit Services
- Electron Microscopy
- X-ray | NMR
- Validation Server
- BioSync Beamlines/Facilities
- Related Tools

Tools Hide
- Download Files
- Compare Structures
- Drug & Drug Target Mapping
- File Formats
- RESTful Web Services
- Widgets

Summary | 3D View | Sequence | Annotations | Seq. Similarity | 3D Similarity | Literature | Biol. & Chem. | Methods | Geometry | Links

FRUCTOSE 1,6-BISPHOSPHATE ALDOLASE FROM HUMAN LIVER TISSUE

1QO5 Display Files | Download Files | Share this Page

DOI:10.2210/pdb1qo5/pdb

Primary Citation

The structure of human liver fructose-1,6-bisphosphate aldolase.

Dalby, A.R., Tolan, D.R., Littlechild, J.A.

Journal: (2001) Acta Crystallogr.,Sect.D **57:** 1526-1533

PubMed: 11679716
Search Related Articles in PubMed

PubMed Abstract:

The X-ray crystallographic structure of the human liver isozyme of fructose-1,6-bisphosphate aldolase has been determined by molecular replacement using a tetramer of the human muscle isozyme as a search model. The liver aldolase (B isozyme) crystallized in space group C2,... [Read More & Search PubMed Abstracts]

Molecular Description Hide

Classification: Lyase
Structure Weight: 710444.68

Molecule: FRUCTOSE-BISPHOSPHATE ALDOLASE B
Polymer: 1 **Type:** protein **Length:** 363
Chains: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R
EC#: 4.1.2.13
Organism Homo sapiens
Gene Names ALDOB ALDB
UniProtKB: Protein Feature View | Search PDB | P05062

Biological Assembly 1

3D View | More Images...

Symmetry: **D2** view
Stoichiometry: **Homo 4-mer - A4**
Biological assembly 1 generated by PQS (software)

Downloadable viewers:
Simple Viewer | Protein Workshop | Kiosk Viewer

MyPDB Personal Annotations Hide

To save personal annotations, please

What is Bioinformatics data?

- Now imagine the question(s) is:
  - "What is the *length* of your protein-number of amino acids?"

    or

  - "What Enzyme Classification or (EC#) does your enzyme belong?"

How we did it

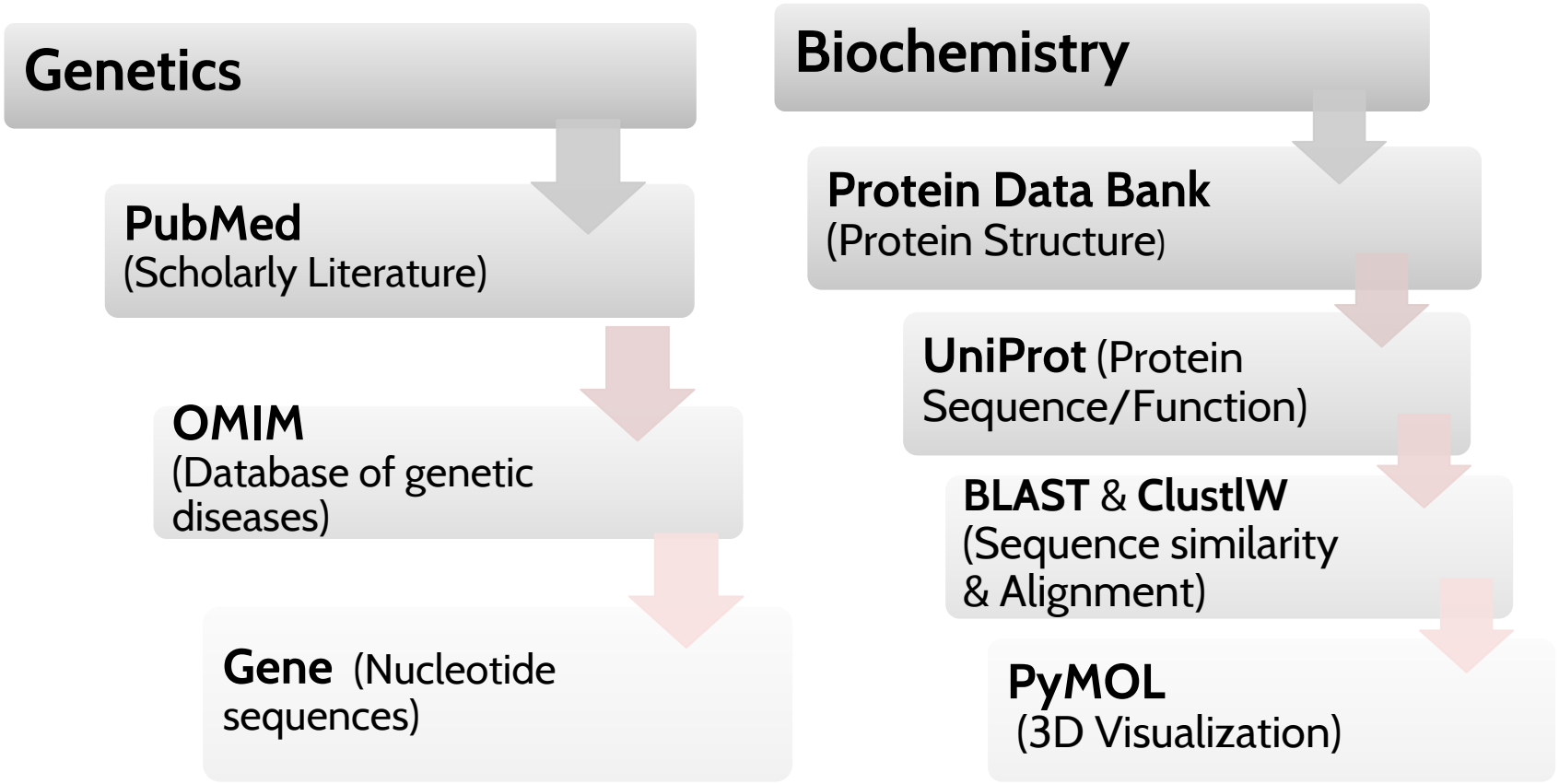
Authentic pathway activity that replicates researcher workflow

Scaffolded steps, hands on practice

Emphasize interoperability

Short term lab assignment + longer term major assignment

Bioinformatics – Interoperability



Sample Questions

- **BIOL 311- Genetics**
  - On which chromosome is your gene located?
  - What is the inheritance pattern of your disease topic?

- **BCEM 393- Biochemistry**
  - Locate your protein's 3D coordinates
  - What is the length of your protein (e.g. number of Amino Acids)?

Gene Data Example

NCBI's Gene portal – links to gene & protein data and PubMed

(e.g. Cystic fibrosis = CFTR Gene)

Gene

Display Settin

CFTR cystic fibrosis transmembrane conductance regulator (ATP-binding cassette sub-family C, member 7) [*Homo sapiens* (human)]

Gene ID: 1080, updated on 8-Jun-2014

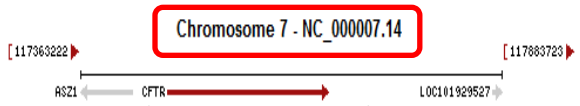
Summary

Official Symbol	CFTR provided by HGNC
Official Full Name	cystic fibrosis transmembrane conductance regulator (ATP-binding cassette sub-family C, member 7) provided by HGNC
Primary source	HGNC:1884
Locus tag	tcag7.78
See related	Ensembl:ENSG00000001626; HPRD:03883; MIM:602421; Vega:OTTHUMG00000023076
Gene type	protein coding
RefSeq status	REVIEWED
Organism	Homo sapiens
Lineage	Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi; Mammalia; Eutheria; Euarchontoglires; Primates; Haplorrhini; Catarrhini; Hominidae; Homo
Also known as	CF; MRP7; ABC35; ABCC7; CFTR/MRP; TNR-CFTR; dJ760C5.1
Summary	This gene encodes a member of the ATP-binding cassette (ABC) transporter superfamily. ABC proteins transport various molecules across extra- and intra-cellu seven distinct subfamilies (ABC1, MDR/TAP, MRP, ALD, OABP, GCN20, White). This protein is a member of the MRP subfamily that is involved in multi-drug res chloride channel and controls the regulation of other transport pathways. Mutations in this gene are associated with the autosomal recessive disorders cystic fib deferens. Alternatively spliced transcript variants have been described, many of which result from mutations in this gene. [provided by RefSeq, Jul 2008]

Genomic context

Location: 7q31.2

Annotation release	Status	Assembly	Chr	Location
106	current	GRCh38 (GCF_000001405.26)	7	NC_000007.14 (1174707
105	previous assembly	GRCh37.p13 (GCF_000001405.25)	7	NC_000007.13 (1171200



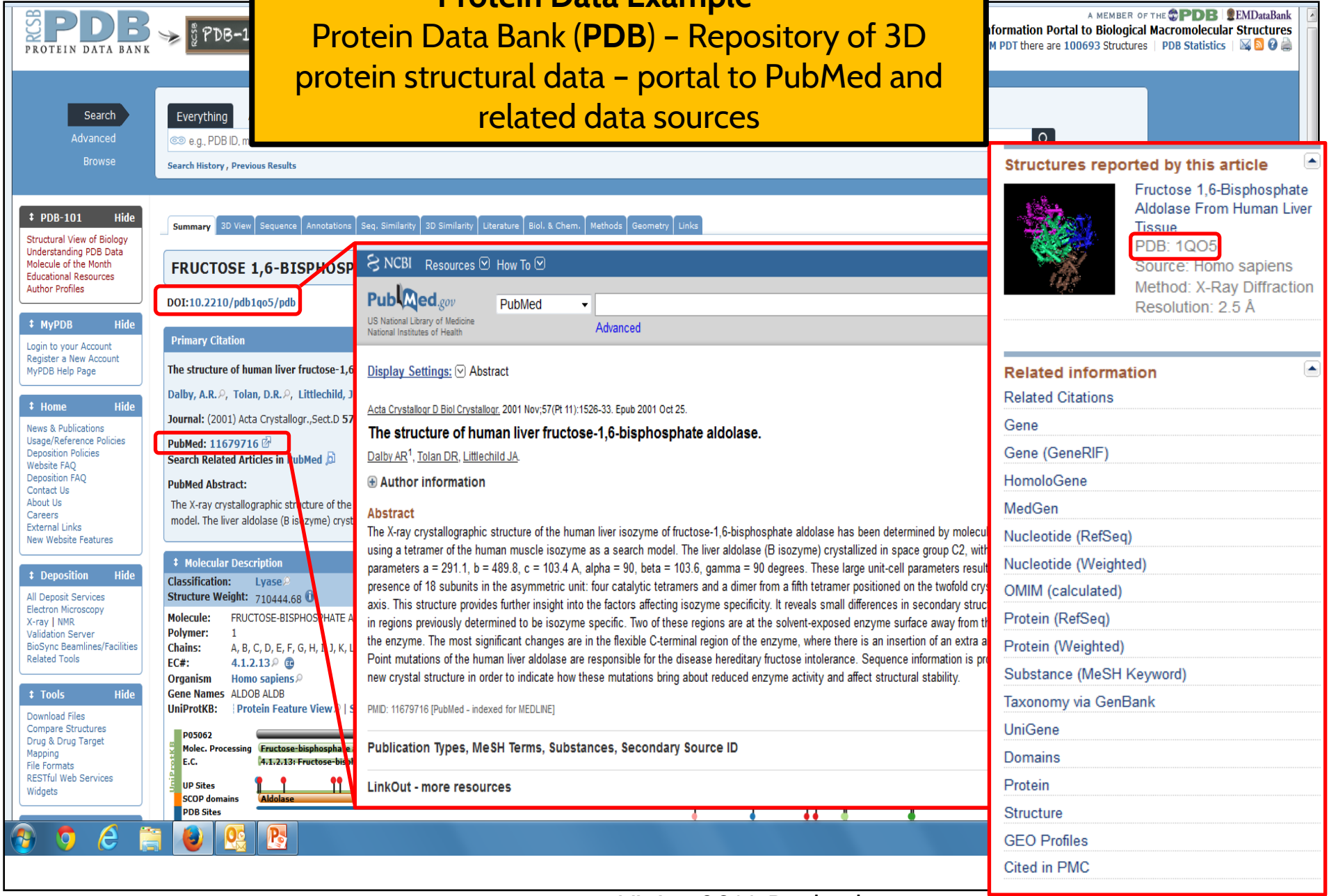
Full text in PMC_nucleotide
GAP
Gene neighbors
Genome
GEO Profiles
GTR
HomoloGene
Map Viewer
MedGen
Nucleotide
OMIM
Probe
Protein
PubChem Compound
PubChem Substance
PubMed
PubMed (GeneRIF)
PubMed (OMIM)
PubMed(nucleotide/PMC)
RefSeq Proteins
RefSeq RNAs
RefSeqGene

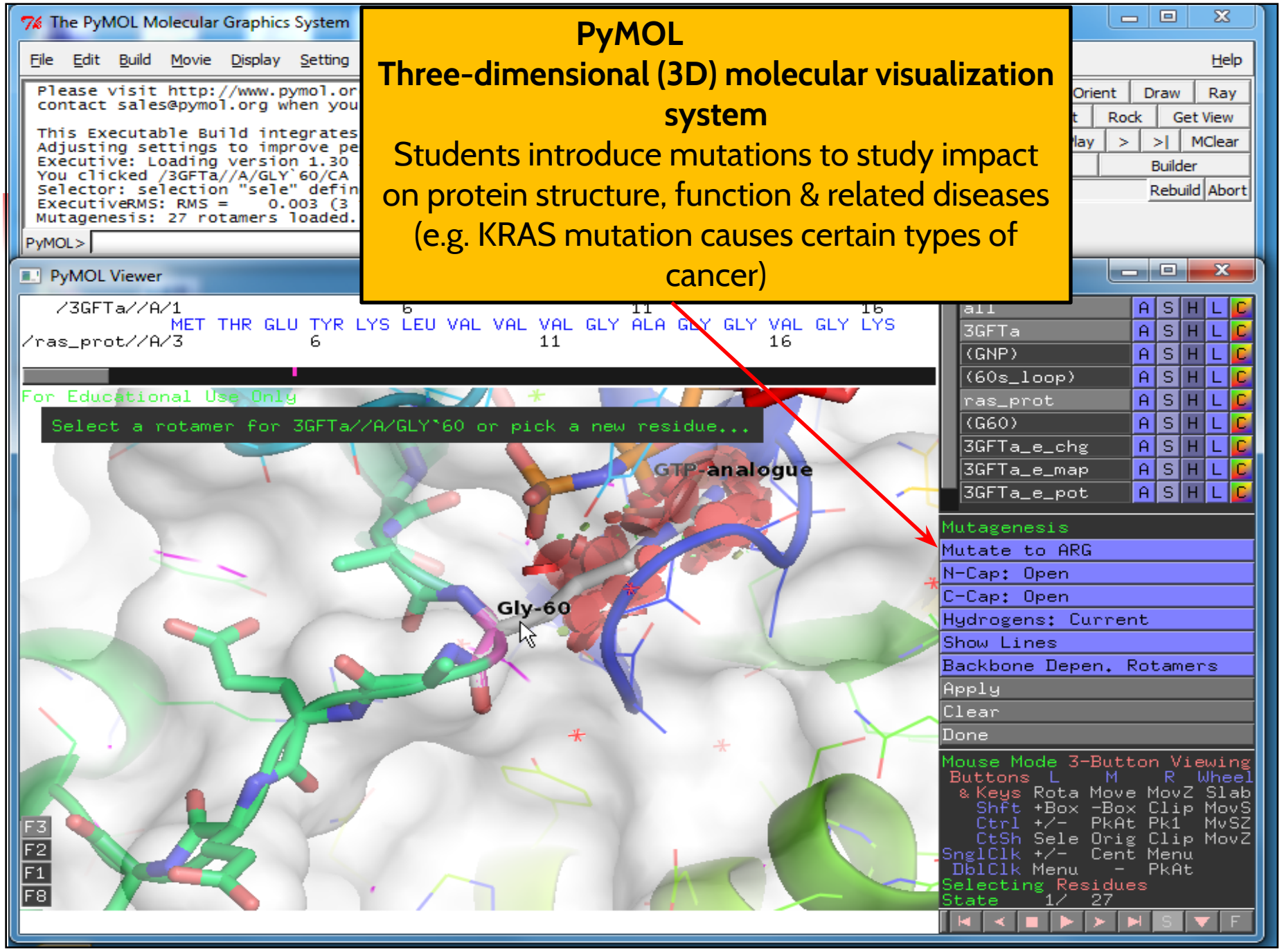
Summary
Genomic context
Genomic regions, transcripts, and proc
Bibliography
Phenotypes
Variation
Interactions
Pathways
General gene information
Markers, Related pseudogene(s), H
General protein information
Reference sequences
Related sequences
Additional links
Locus-specific Databases

Related information
Order cDNA clone
3D structures
BioAssay
BioAssay by Target (List)
BioAssay by Target (Summary)
BioAssay, by Gene target
BioAssay, RNAi Target, Active
BioProjects
BioSystems
Books
CCDS

Protein Data Example

Protein Data Bank (**PDB**) – Repository of 3D protein structural data – portal to PubMed and related data sources





PyMOL

Three-dimensional (3D) molecular visualization system

Students introduce mutations to study impact on protein structure, function & related diseases (e.g. KRAS mutation causes certain types of cancer)

Implications for Libraries

Data competencies inform domain expertise and…vice versa

Align library activities with faculty needs, *data life cycle,* (*Jaguszewski & Williams 2013*)

Librarian's need to offer more expertise…value (*Kenney (Ithaka), 2014*)

Collaboration & "soft skills" critical to leveraging expertise and expanding services

Results in a more rigorous & sustainable IL program

Impact on student learning

Innovative learning experience for students – data integrates & informs content

Students will be able to manage and analyze their data more efficiently

Students able to find "real world" solutions to research questions

Peer-reviewed presentations demonstrate deeper understanding of subjects

Best Practices

Must be course-integrated – worth %

Scaffolded, sequential steps – simple to complex - data & bibliographic resources

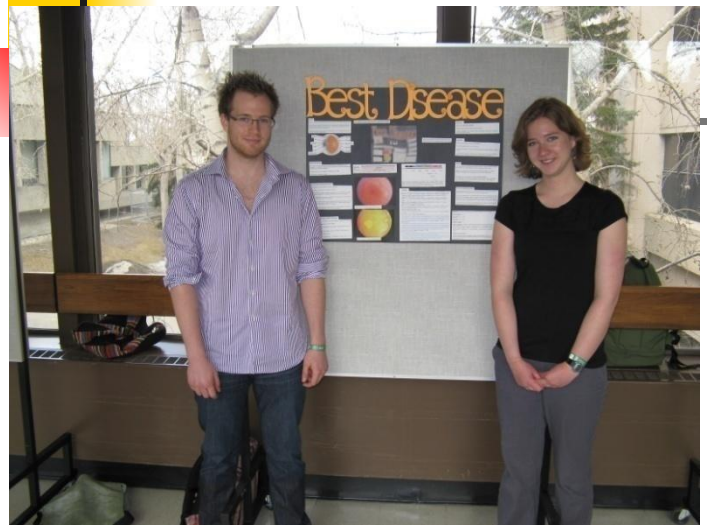
Students learn best by doing – allow hands-on interactivity & flexibility

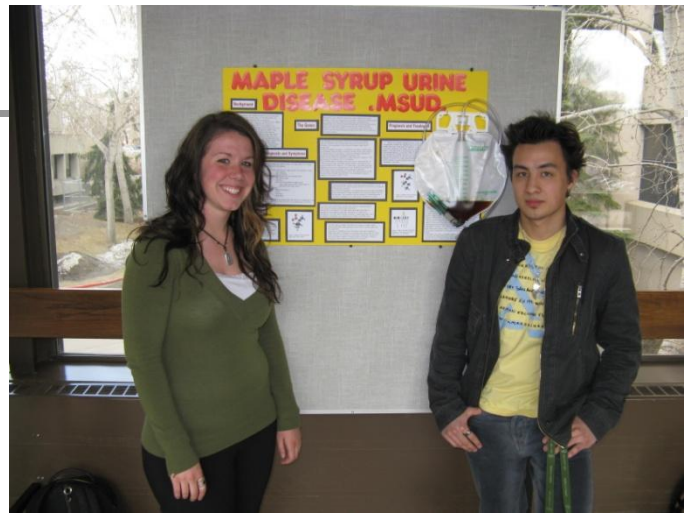
Tailor relevant data sources to specific questions

Consistent instruction across all lab sections – TA's not always experts

A few of our students ...

Participation in the third annual Biological Student's Conference





Student feedback

- "It was good that we were able to use things that we learned in BIOL 311 to understand things in BCEM 393. I think that I learned more because I could see how labs and topics in the two courses related to each other"
- "I liked how the library and computer labs were hands-on. The TAs and library people were there to help us and not just tell us what to do. I think it was more fun and we got more out of it by doing things on our own instead of following a step-by-step recipe in the lab manual"
- "The presentations gave me the chance to learn many valuable skills. I liked picking the disease to study and doing the project with a partner. I also liked hearing about how other groups went about doing their projects in different ways"

Assessment

- Students prepare poster & presentation (mark and peers)
- Peer-Review "Marking Rubric"
- TooFast https://www.toofast.ca/
- Impact on academic productivity - effective?

Peer-Review Marking Rubric

APPENDIX C: PEER-REVIEW MARKING RUBRIC FOR PRESENTATIONS

Names:_____

Topic:_____

	4 – Excellent	3 – Good	2 – Fair	1 – Area of growth	Grade (out of 4)
Delivery	• Hold attention of entire audience with the use of eye contact, seldom looking at notes • Speak with fluctuation in volume and inflection to maintain audience interest and emphasize key points	• Consistent use of direct eye contact with audience, but still returns to notes • Speak with satisfactory variation of volume and inflection	• Display minimal eye contact with audience, while reading mostly from the notes • Speak in uneven volume with little or no inflection	• Hold no eye contact with audience, as entire report is read from notes • Speak in low volume and/or monotonous tone, which causes audience to disengage	____ / 4
Content/ organization	• Demonstrate full knowledge by answering all class questions with explanations and elaboration • Provide clear explanation of effects of mutation on protein structure and how this affects the inheritance pattern of the disease	• Are at ease with expected answers to all questions, without elaboration • Provide somewhat clear explanation of effects of mutation on protein structure and how this affects the inheritance pattern of the disease	• Are uncomfortable with information and are able to answer only rudimentary questions • Attempt to explain the effects of the mutation on protein structure, but do not adequately show why the disease is dominant or recessive	• Do not have grasp of information and cannot answer questions about subject • Do not clearly explain the effects of the mutation on protein structure nor how these effects cause the disease's inheritance pattern	____ / 4
Enthusiasm/ audience awareness	• Demonstrate strong enthusiasm about topic during entire presentation • Significantly increase audience understanding and knowledge of topic; convince an audience to recognize the validity and importance of the subject	• Show some enthusiastic feelings about topic • Raise audience understanding and awareness of most points	• Show little or mixed feeling about the topic being presented • Raise audience understanding and knowledge of some points	• Fail to increase audience understanding of knowledge of topic • Show no interest in topic presented	____ / 4

TOTAL: ___ / 12

APPENDIX B: G.T.A. MARKING RUBRIC FOR PRESENTATIONS

Name:_____

Topic:_____

Content (6 marks):

Give 2 marks if that aspect is well done, 0.5 marks for evidence of effort, and 0 for no effort.

_____ appropriate amount of background information is presented, with protein and mutation clearly identified and described
_____ the effects of the mutation on protein structure are clearly explained through a detailed description of the disruption of any non-covalent interactions and the introduction of any steric clashes
_____ the effects of the mutation on protein function are clearly explained, providing a model that can be used to explain the links between the inheritance pattern and the effects of the mutation on protein structure and function (*i.e.*, why is the disease recessive or dominant based on the mutation's effect on protein structure and function?)

Presentation (6 marks):

Give 1 mark if that aspect is well done, 0.5 marks for evidence of effort, and 0 for no effort.

_____ demonstrates good speaking skills (tone, volume, pace, avoiding "ums", "you know", etc.)
_____ logical and confident delivery of material
_____ presenter makes eye contact, engages the audience and is enthusiastic
_____ presentation is clear and visually appealing
_____ equal participation of group members
_____ references are properly cited and presented in the presentation

Answering questions (2 marks):

2 marks will be given if all questions are answered thoroughly
1 mark will be given if the questions are only partially answered
0 marks will be given if the questions are not answered satisfactorily

Asking questions to others (2 marks):

Bibliography

- Jaguszewski, J.M., Williams, K. (2013). *New Roles for New Times: Transforming Liaison Roles in Research Libraries*. Association of Research Libraries. Retrieved from http://www.arl.org/storage/documents/publications/NRNT-Liaison-Roles-final.pdf

- Kenney, A.R. (2014) *Leveraging the Liaison model: From Defining 21st Century Research Libraries to Implementing 21st Century Research Universities.* Ithaka S+R. Retrieved from http://www.sr.ithaka.org/sites/default/files/files/SR_BriefingPaper_Kenney_20140322.pdf

- ACRL Research Planning and Review Committee. (2014). *Top trends in academic libraries A review of the trends and issues affecting academic libraries in higher education.* College & Research Library News, 75(6), 294-302. Retrieved from http://crln.acrl.org/content/75/6/294.full.pdf+html

Thank You!

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Resources

- NCBI
  http://www.ncbi.nlm.nih.gov/
- OMIM
  http://www.ncbi.nlm.nih.gov/omim
- Protein Data Bank
  http://www.rcsb.org/pdb/home/home.do
- UniProt
  http://www.uniprot.org/
- PyMOL
  http://www.pymol.org/
- Course related Libguides
  http://libguides.ucalgary.ca/content.php?pid=55723&sid=413079