AIHEC CYBERINFRASTRUCTURE INITIATIVE

TCU STEM LEADERS UPDATE

September 1, 2020
AIHEC’s STEM Initiatives

Strengthening the tribal college movement

- Contributing to Native Nation-building
- Growing STEM leaders from the community
- Facilitating Tribal economic development through participation in the national STEM economy
- Strengthening national AI/AN STEM career pathway
- Helping address local issues (e.g. climate change)
AIHEC TCU
Cyberinfrastructure Study Project

A two-year project to:

- examine the capability of each TCU’s cyberinfrastructure to support participation in the national STEM education and research infrastructure

- provide a primary planning and evaluation resource of TCU national and regional connectivity, compute capabilities, and human resource requirements

- provide information needed by each TCU to articulate (or update) and begin implementing a sustainable Campus Cyberinfrastructure Plan
Cyberinfrastructure 101

• United States federal research funders use the term cyberinfrastructure to describe research environments that support advanced data management, data integration, data analytics, data visualization and other computing and information processing services distributed over the Internet beyond the scope of a single institution.

• In scientific usage, cyberinfrastructure is a technological and sociological solution to the problem of efficiently connecting laboratories, data, computers, and people with the goal of enabling derivation of novel scientific theories and knowledge.
Study Takeaway #1: IT staffing

• TCUs spend around half of their IT budgets on staff
• Very few TCUs employ students to provide tech support to the campus user community
• Using students could free up IT techs to focus on other issues
• It would provide students valuable hands-on experience and skill-building in IT
Takeaway #2: Equipment replacements

• TCUs don’t seem to replace network equipment regularly
• The average is 8.29 years between replacements
• Standard practice is closer to 3-5 years
Takeaway #3: Internet Connectivity

- Overall connectivity is pretty good: TCUs average 513 Mbps connection speeds
- Maximum: 2,000 Mbps; Minimum: 10 and 15 Mbps
- Average Internet connection cost is $60K/year
Takeaway #4: Information Security

• Over 20% of TCUs don’t separate servers that manage credit card, student information from the campus network
• These TCUs can’t meet basic data security requirements of PCI, FERPA, GLBA
Some General Recommendations

• Participatory/engaged IT governance
• More focus on risk management
• Dedicate more resources to IT organizations
• Strength in numbers: more collaboration/resource leveraging among TCUs
TCU Cyberinfrastructure Study Outcomes

- **Campus infrastructure:** developed IT infrastructure upgrade/improvement recommendations for 35 TCUs
- **IT personnel:** facilitated IT community of practice, collaboration among TCUs, support for national meetings
- **CI partnerships:** established partnerships with national CI resources/stakeholders: TACC, CCAST, Northern Tier Network Consortium, Internet2, Open Science Grid, HTCondor
- **TCU STEM R&E:** developing CI education platform: Climate Collaboratory, other CI education resources for all TCUs
- **Funding:** study informed the request for the $20M for TCU infrastructure in the CARES Act; secured additional $1.9 million funding to develop CI at TCUs
Next Steps: support TCUs to develop CI-enabled STEM for local needs

**Technical focus**
- Enhanced site visits
- IT Community of Practice
- IT training
- Regional/national partners

**Academic focus**
- Expanded STEM course offerings
- Capacity building in research
- Research opportunities
- Leverage TCUP funding
Cyberinfrastructure Partners

- Texas Advanced Computing Center
- Center for Computational Assisted Science and Technology (CCAST)
- Open Science Grid - HTCondor
- Internet2
- Oklahoma Supercomputing Center
- University of Miami
  - Cooperative Institute for Marine & Atmospheric Studies (CMAS)
  - Institute for Data Science and Computing (IDSC)
Research Computing in the Cloud

You can design and deploy experiments accessing HPC environments with hundreds or thousands of high-end processors from any connection to the Internet.

• Examples of cloud computing resources:
  • Amazon Web Services (AWS)
  • Microsoft Azure
  • Google Cloud Platform
Here's a snapshot of your progress in your Learning Journeys.

**Computational Climate Science**

- **Introduction to Computational Climate Science**
  - Skill Score: 20
  - Last accessed 6s ago

- **Introduction to Climate Science**
  - Skill Score: 40
  - Last accessed 6s ago

- **Introduction To Linux**
  - Not Started

- **Introduction to Scientific Python**
  - Skill Score: 0
  - Last accessed 4s ago

- **Using Jupyter Notebooks**
  - Not Started

- **Fundamental Skills for Comp. Climate Science**
  - **Scientific Python Skills**
    - Not Started
  - **Data Access - Thredds Data Servers**
    - Not Started
  - **Wind Vector Analysis**
    - Not Started
  - **Vertical Wind Vector analysis**
    - Not Started
  - **Pressure Maps**
    - Not Started

- **Intermediate Skills for Comp. Climate Science**
  - **Temperature Gradients**
    - Not Started
  - **Frontogenesis**
    - Not Started
  - **Vorticity**
    - Not Started
  - **Precipitation**
    - Not Started
AIHEC’s CI Initiative

Moving Forward

• TCU CI stakeholder survey
• CI strategic planning
• CI capacity building: Praxis TILE LXP
• Identify TCU CI research/education clusters
• Broker CI-enabled R&E partnerships
• Continue TCU Communities of CI Practice
TCU CI Stakeholder Survey
to be sent out mid-September

• The entire TCU campus community invited to participate
• Initiate CI strategic planning at all interested TCUs
• Drive CI-enabled R&E partnerships
• Identify TCU research/education priorities
• Form TCU programmatic clusters (health, climate)
• Align TCU internal and external stakeholders
CI Strategic Planning Workshop Series: NSF TCUP

Goals
- Engage TCUs in CI strategic planning
- Facilitate initial stages of CI strategic planning at participating TCUs
- Assist TCUs in developing CI planning proposals to NSF

Activities
- Start with CI Stakeholder Survey
- Recruit TCUs committed to the CI strategic planning process
- Convene TCU CI stakeholders for plenary web meeting
- Provide MS Teams workspace for each TCU planning team
- Recruit CI consultants based on TCU STEM research priorities and CI needs
- Facilitate asynchronous and synchronous planning activities with each TCU team
- Support TCUs with CI proposal development
CI Research Alignment Project: NSF CC*

**Goals**
- Develop TCU CI technical capacity
- Support CI-enabled STEM at TCUs
- Facilitate CI strategic planning

**Activities**

**Technical**
- Support CI community of practice among TCU IT organizations
- Provide professional development opportunities for IT staff
- Facilitate professional networking for IT staff within CI technical community

**STEM programs**
- Provide professional development opportunities for TCU faculty in CI-enabled STEM
- Facilitate CI STEM capacity-building

**CI Strategic Planning**
- Conduct enhanced site visits to support CI needs assessment/upgrades
- Support CI planning through to completed plan at select TCUs
CI Working Group: NSF TCUP

Goals
• Improve the quality of STEM programs through CI partnerships
• Increase engagement in CI-enabled STEM at TCUs
• Reinforce TCU STEM community of practice

Activities
• Virtual meetings (including opening plenary) with CI stakeholder community to share information about programs and generate collaboration ideas
• Online asynchronous discussions among participants
• Develop research opportunities for TCU faculty and students
• Identify TCU STEM course and curriculum gaps/opportunities
CyberTeam Project: NSF CC*
North Dakota TCUs and NDSU

Goals
• Advance ND TCU CI readiness
• Establish CI research and education practitioner community
• Implement workforce development for faculty and students
• Facilitate CI-enabled research partnerships

Activities
• Enhanced TCU site visits
• Support TCUs in implementation of CI upgrades
• Develop CI education/training resources
• Provide training for faculty and students in research computing focused on their research interests
• Train and support TCU students to staff campus IT help desks
• Provide research planning and implementation support to participating faculty
How to Get Involved

• Complete the CI Survey
• Watch for meeting announcements!
• Participate in the plenary sessions to learn more
• Involve your IT/technology planning team, if you have one
• Form a planning team if you don’t have one already

We can get started working with you and your team immediately – Let us know!
Other STEM Projects/Ideas

• Indigenizing STEM Textbooks with Open Education Network
• Climate science curriculum
• Indigenous Design Collaborative
• Online research skills training for student internships
• Your ideas, suggestions?
AIHEC CI Initiative Team

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