Online STEM Education

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Scale and long-term viability

- The most powerful mode of instruction for reaching large numbers
- More affordable than traditional teaching
- More environment friendly
- Accessibility: access quality education without relocation
- Flexibility: balancing education with other activities
- Cost effectiveness

Challenges (1)

- Differ between synchronous and asynchronous online education

- There is an issue of lack of engagement and self discipline. Problems with attending sessions and participating regularly, submission of assignments and adhering to deadlines, active participation in discussions and peer collaboration.

- Structured schedules help students maintaining focus.

Challenges (2)

- Feeling of isolation and reduced motivation leading to difficulty in maintaining focus.
- Understanding difficult concepts: problems with language and scientific background
- Lack of effective support and peer-learning
- Digital divide: lack of access to reliable internet and devices.
- Assessment integrity

Personal Experience

- Experience during Covid epidemic
- Experience after eruption of war in Sudan: Medicine and Engineering
- The degree of learning and academic performance were not satisfactory for university and collaborating institutions.

Hands-on experience: engineering students

- Bridges the gap between theoretical knowledge and real-world application
- Enhance understanding: helps students grasp complex engineering principles more effectively.
- Develops problem-solving skills, encourages critical thinking and innovation
- Industry readiness: technical competence, employability

Enhance engagement and effectiveness

- Advanced technology: The main objectives: more interactive and personalized (tools like virtual simulations, gamification, AI-derived personalized learning experiences
- Strengthening online community and support: virtual students community and online networking events.
- Faculty development programs.
- Making online education superior to traditional education: Involvement of big companies

Monitoring effectiveness (1)

- Use of Learning management systems(LMS):
  - Monitor student activity, including log-in frequency, participating in discussions, and assignment submissions.

- To maintain academic integrity.:
  - Assessment and performance evaluation: use of automatic grading systems, AI-powered plagiarism detection etc.

Monitoring effectiveness(2)

- Self checks and automated assessments:
  - integrate self-check quizzes, computer –marked assignment and teacher-marked assignment.
- Track students interaction levels:
  - through virtual classrooms, discussion forums, and group projects. Use of early warning systems (EWS)
- Feedback and continuous improvement:
  - Regular students surveys, peer reviews and faculty evaluation help institutions refine online courses and improve teaching methodologies.

Financial models

- Tuition:
- Endowments , non-profit and philanthropic support. and grants
- Sharing resources: faculty and technology.
- Public-private partnership:
  - Government collaborates with the private sector
- Industry-academic partnerships:
  - Corporations to offer grants and scholarships and work with universities to design specialized online courses
  - ?Tech giants like Google and Microsoft.
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- Hybrid funding model

Government funding

- Online education will be competing with traditional education for scarce government funds.
- Decision makers and most academics consider online education as second class education
- Governments will allocate funds to online education when it becomes an integral part of national development plans which work towards achieving SDGs.

Cost management strategies

- Is crucial for sustainability and efficiency
- Activity-based costing (ABC) approach
- Shared services lower expenses.
- Technology-Driven efficiency:
  - Using AI-powered grading systems, automated assessment.

  Hybrid courses and asynchronous courses optimize faculty workload and reduce infrastructure expenses.
- Explore multiple revenue streams

Measuring sustainability in online education (1)

- Environmental issues : decrease emission
- Energy efficiency
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- Cost effectiveness: affordability and operational savings
- Revenue generation
- Government and institutional investment

Measuring sustainability in online education (2)

- Student's accessibility: inclusivity for learners, include those in remote areas.
- Engagement and retention rates
- Faculty training: Measuring effectiveness in digital teaching methods