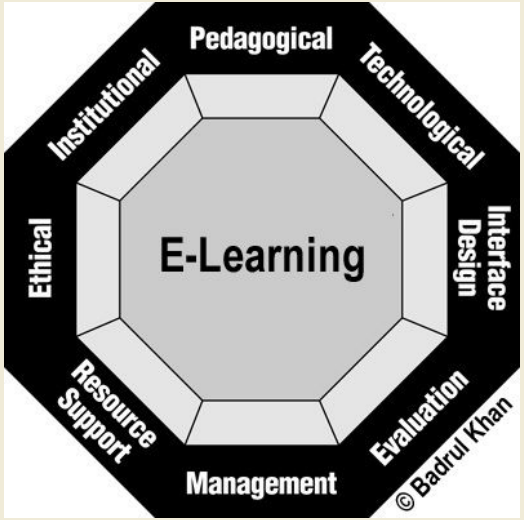
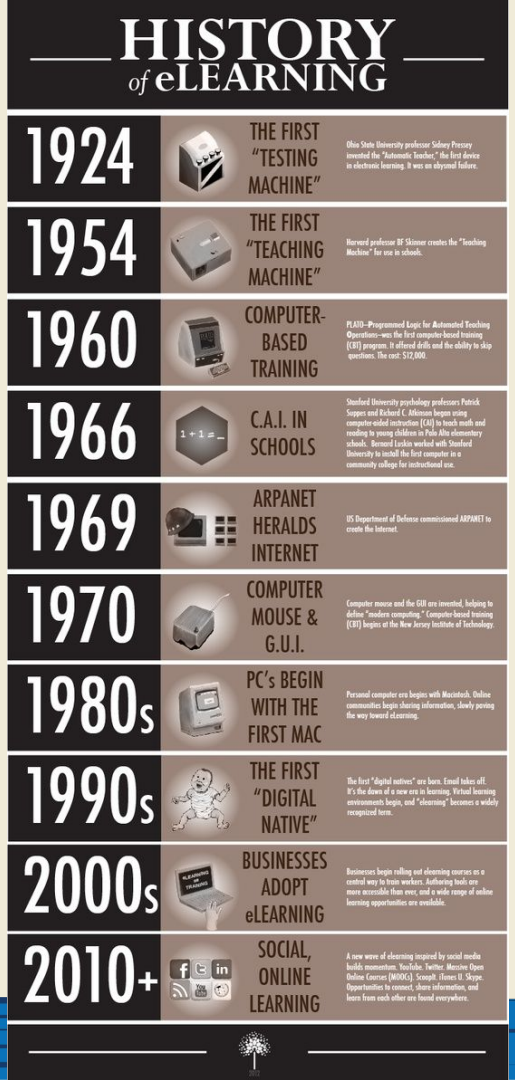
#DefiSummer

eLearning & Blockchain

Other Words Used in Place of E-Learning

- Electronic-learning, Online learning, remote learning, distance learning blended learning, Instructional design



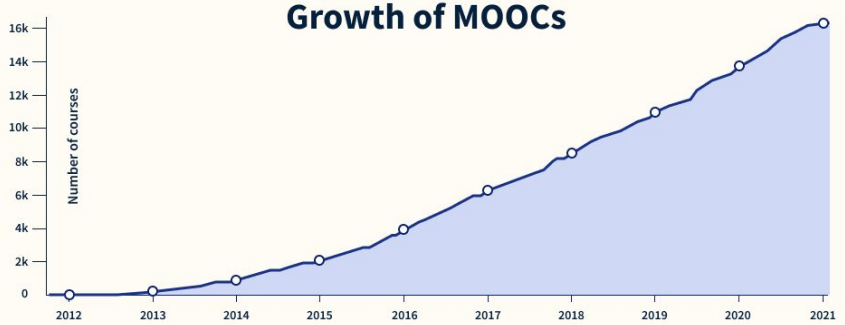


History of eLearning

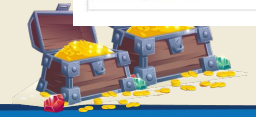
- Early 90's schools began to deliver courses online
- In 2000s businesses used eLearning to train employees
- 2005: Rise of Adobe Flash
- Online universities allowed the gaining of degree and/or completion of courses online
- Covid: everyone forced to remote

Rise of MOOCs

- A massive open online course (MOOC) is an online course aimed at unlimited participation & open access via the Web.



	Learners	Courses	Microcredentials	Degrees
Coursera	76 million	4,600[3]	610	25
edX	35 million	3,100	385	13
FutureLearn[2,4]	14 million	1,160	86	28
Swayam[2]	16 million	1,130	0	0



Online Learning Revenue Models

- solutions for universities
- Ad Supported/ Sponsored Content
- Content Marketing
- Training for enterprise
- Freemium Moocs
- 1-1 mentorship sessions

- Udemy - Marketplace Business Model
- Coursera - certification, secure assessments, employee recruiting, employee or university screening, human-provided tutoring or manual grading, corporate/university enterprise model, sponsorships, and tuition fees

Open-Source Learning Management Systems (LMS)

- Moodle
- Canvas
- OpenEdX

What Are Schools Using for Remote Learning

Table 1. Comparison of existing e-Learning tools

Tools	Availability free*/paid	Video confer-encing	Content sharing	Mobile support	Comments / feedbacks	Supported assesments
Blackboard	paid	yes	yes	yes	yes	Assignments Surveys Quizzes(MCQs, True/false, Fill in the blanks, short questions, Essays, file response, Colum matching)
Nearpod	Paid	Yes	Yes	Yes	Yes	Assignments Polls Quizzes (open-ended questions, fill in the blanks, draw its)
Microsoft teams	Free*/paid	Yes	Yes	Yes	Yes	No
Zoom	Free*/paid	Yes	Yes	Yes	Yes	No
Team viewer	Free*/paid	Yes	Yes	Yes	Yes	No
Google class-room	Free	Yes	Yes	Yes	Yes	Assignments Quiz assignments using Google
Skooler	Paid	Yes	Yes	Yes	Yes	Assignments Quizzes
Schoology	Free*/Paid	Yes	Yes	Yes	Yes	Assignments Quizzes
ClassDojo	Free	Yes	Yes	Yes	Yes	No
Moodle	Free	Yes	Yes	Yes	Yes	Assignments Quizzes
Desire2Learn	Paid	Yes	Yes	Yes	Yes	Assignments Quizzes
Canvas	Free	Yes	Yes	Yes	Yes	Assignments Quizzes

Biggest eLearning Platforms

Platform	Perks	Cost plan
Coursera	Financial Aid provided selectively	Individual courses/Specialization
Skillshare	Instructors can create content thru stepwise guidelines provided Referral compensation provided for teachers if students subscribe to premium package	free, premium, and team pricing plan Starts at $8 per month
LinkedIn Learning	Job search and credentials automatically added to LinkedIn profile	One month free trial $29.99 per month
Udacity	Micro-credentials (NanoDegree)	Free upto 200 courses Nanodegree costs $200-$2400 per month
Udemy	Instructors can create, share, promote their courses via targeted ads, search/discovery, email campaigns, and external partner promotion	Offers free trial Courses start from @12.99 Business pricing - $360 per year per user
edX	University level online courses - (Havard, MIT, Berkeley , etc) Six types of programs offered - one-off courses, MicroMasters Program, Professional Certificates, Global Freshmen Academy and XSeries Program	Unverified courses are free Verified range from $50 - $300

Learning Incentivization Explained

- Gamification - Game Theory
- Not just for school - but for delivering better products
- Before Crypto - Token Reward System -
  - Recognition of Status
  - points, badges and pins
  - leaderboards
  - certification

To ensure consistency, educators must do the following:

- set clear goals, i.e. the behaviours you wish to see
- explain how the reward system works to the children, including the amount of tokens that are required to achieve a privilege
- be vigilant of behaviour that requires reward
- be consistent about the behaviour that elicits a reward

Considerations for Developing A Learning App

- How to prevent cheating?
- What is audience? Internet connectivity? Online training vs course? Level of difficulty?
- How to validate learning objective complete in an automated way? For ex; grading free response questions
- certain subjects like the humanities tend to be limited based on automated validation systems where correctness allows for instant verification
- Delivery of learning?
- Will it be instructor less? How are questions addressed? How are things appended
- Instructor to student estimated? Mooc vs tutoring scale.

SCORM

Sharable Content Object Reference Model

Shareable Content Object Reference Model is a collection of standards and specifications for web-based electronic educational technology. It defines communications between client side content and a host system, which is commonly supported by a learning management system. Wikipedia

- Creating units of online training materials that can be shared across systems
- Technical standard for eLearning content

Problems With Current eLearning System

- Single point of failure, lack of transparency, scalability issues
- Not open, limited access
- Failure to grab attention
- Cheating

Solutions

- Varied question sets of similar difficulty, randomization, 1 question at a time approach
  - Makes difficult for students to share answer keys
- Restricting testing times, delaying score availability (“confirmation time” in validation systems)
- Biometric/authentication solutions: TypingDNA, 2FA Wallet Connect (DID) etc,
- Questions that require thinking
- Micro-learning, small bite-sized learning modules

Blockchain & Learning

- Open source information - borderless, stateless
- Credentialing, Certification, Immutability - Direct Talent Pipelining & Fraud/Plagiarism Prevention
- Intellectual Property, Attribution, Monetization
- Gamification, Reputation, Course Tracks, Rewards
- Results Based Financing

Blockchain eLearning Stack

Blockchain-Based secure framework for e-learning during COVID-19

March 2020 Indian Journal of Science and Technology 13(12):1328-1341
DOI:10.17485/IJST/v13i12.152

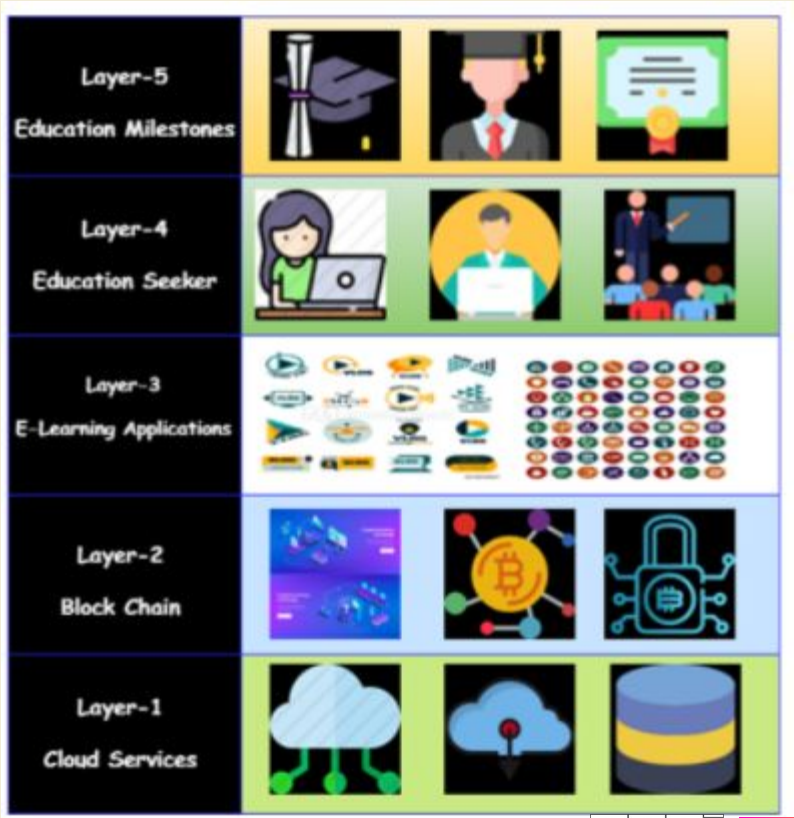


Fig 13. Blockchain-based EL framework

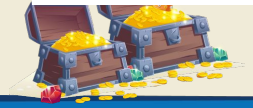
Blockchain Based Certification

- Central New Mexico Community College in Albuquerque last year began issuing “student-owned digital credentials” on a blockchain platform that the college plans to make available to other educational institutions in the state.
- Blockcerts
- Sony Global Education - IBM - Student Record Sharing

Education (2016). Centre for Blockchain Technologies in University College London (UCL) implemented a pilot program that offers the MSc graduates in Financial Risk Management to instant verification of their academic qualifications using bitcoin (UCL, 2020).

JOERI CANT SEP 21, 2019

Swiss University Fights Fake Diplomas With Blockchain Technology



Designing Simple Blockchain eLearning App

The main component functions can be described as follows:

- Login function
  - The security of login
  - Reset the forgotten password(option)
- Privilege control
  - User role with different privilege
  - Different pages when changing to different user role
- The approval process (student->>checker->>supervisor->>administration staff->>head of school)
- Multi-signature function
- Auditing the certificate
  - View the published certificate
  - View the signed certificate
  - View the certificate ready to sign
- Revoking the certificate
  - For one certificate
  - For batch certificates
- Switch different environment (runtime environment/testing environment)
- Administration page to manage the data, the privilege and more.
- Cold storage for the keys (will release in next version)

- *Curriculum*: a set of courses chosen by a learner;
- *CourseModule*: a course created by a teacher;
- *ModuleUnit*: a *CourseModule* is made up of many of these units;
- *Assessment*: a *ModuleUnit* could contain an assessment;
- *Submission*: a submission is created by a learner for an assessment;
- *Certificate*: a certificate is issued by a teacher to a learner for the completion of an *Assessment*, a *CourseModule*, or a *Curriculum*.

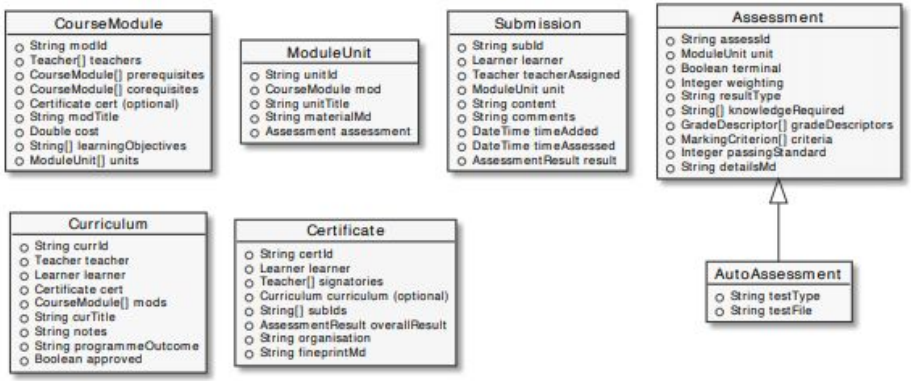


Figure 5. Class diagrams of asset objects on our blockchain

Blockchain Crypto Incentivization

- Coinmarketcap Earn
- Coinbase Earn
- MPA dApp
- Questbook - crypto focused 1-8 quest based incentivization
- Uncrypted
- BitDegree

Online learning or eLearning area has also adopted blockchain technology in certain areas. Zhong, Xie, Zou, & Chui (2018) proposed an application using blockchain technology to improve engagement by rewarding virtual currencies to the top ranked learners based on predefined policies deployed on the blockchain network. Swan (2015) stated that application of blockchain technology may significantly influence the online learning system. Hori et al. (2016, 2018) proposed a decentralized architecture for an e-learning platform named Creative Higher Education with Learning Objects (CHiLO) that can retrieve content resources from the Internet to create the educational materials and distribute on the web, and manage the Internet resources as assets and record them in the blockchain by adopting blockchain smart property.

Limitations

- Quality of information and interactions depending on students and learners
- Boxes tests into transactions limiting complex assessments
- Lack of regulatory precedence for open tokenizing of learning marketplaces
- Limitations of current blockchains to enable microtransactions, fees

Questions!