An Open Networking Lab for practical open education

Conference or Workshop Item

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Version: Version of Record
Online practical learning of computer networking

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OER19, Galway
Vocational learning opportunity

‘Raise UK skill levels by innovative digital solutions for vocational learning’
Open Networking Lab

A free online badged open course

- Teaching the skills of computer networking to beginners
- Experiential learning, practical skills
- Based on a web-based network simulator
- Modes of use:
  - classroom-supported
  - independent, distance learners
- Published on OpenLearn as MOOC BOC
  - open to anyone, anywhere, anytime
  - including assessment → badge
  - OER / open courseware
Pedagogy and learning design

● Sfard (1998): acquisition and participation are both necessary for learning

● Acquisition:
  – Some text
  – Mainly videos (screencasts) demonstrating aspects of networking and setting up activities for students to try out in simulation

● Participation:
  – Experiential practical learning
  – Web-based computer network simulator (PT Anywhere)
  – Structured activities and quizzes

PT Anywhere
An easy to use network simulator

Command line

PC> ping 192.168.0.101

Pinging 192.168.0.101 with 32 bytes of data:
Reply from 192.168.0.101: bytes=32 time=1ms TTL=128
Reply from 192.168.0.101: bytes=32 time=0ms TTL=128
Reply from 192.168.0.101: bytes=32 time=0ms TTL=128
Reply from 192.168.0.101: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.0.101:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>
PT Anywhere

Supports experiential learning, practice based

- Easy to use interface but authentic
- HTML5 - web browser integration
- A simplified user interface to…
  …Cisco Packet Tracer running on server
- Implemented by open API to Packet Tracer
- Code open source
  [https://github.com/PTAnywhere](https://github.com/PTAnywhere)
Part 1. Dynamic Host Configuration Protocol (DHCP)

In this part we will look at how networks can be configured so that new devices can join automatically and not have to be configured manually.

Now watch the video below which is about 10 minutes long.
Pilot evaluation

FE Colleges

- Students 16+, 18+, adult
- Methods:
  - survey (Likert; open comments)
  - teacher interviews
  - classroom observation
  - analytics (website, simulator)
- Pilot 1: 8 colleges, 121 students
- Pilot 2: 8 colleges, 262 students
Did they learn?

“The included PT activities were really useful. The content was relevant for pure beginners.”

Data from Pilot 1 & Pilot 2 student surveys (left n=292, right n=180)
How effective is ONL material?

I know more about home networking now I have done the ONL classes

“I feel this goes into the perfect amount of detail. Enough to give context to everything else but no needless information, definitely the ideal ‘brief overview’”

Previous experience of networking

- nothing
- less than 4 hours
- 4 to 10 hours
- over 10 hours

Number of responses
How engaged were learners?

ONL was interesting to me

“I liked the Open University video as they went through a lot of things in depth”
Do learners like the approach?

If I had the chance to learn more about networking in this way (instead of my usual classes), I would do more ONL.

"I understood what was being taught to me and it was a fresh way of learning" - Student survey feedback.

"I prefer the combination of shorter videos and more practical activities in this session. It keeps you engaged" - Student survey feedback.

Data from Pilot 1 student surveys.
Components – ease of use

It was easy for me to use...

Data from Pilot 2 student surveys (n=28)

“I found it very welcoming for someone of my experience”
Components – learning

I learnt something new from...

- the videos
- the text on the website
- PT Anywhere
- questions within sessions
- end of session quiz

Data from Pilot 2 student surveys (n=29)
Components – engagement

I was interested by...

Data from Pilot 2 student surveys (n=29)
Patterns of engagement

Percentage of content accessed

Student

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Online, video
Online, download
Online, video, download
Video

Percentage of planned study time spent viewing website
Percentage of videos accessed
Percentage of epub or printable versions downloaded
"The included Packet Tracer activities were really useful"

"Would be helpful to have a short quiz after each video, to check understanding, make it more interactive"

"This video is very long and needs to be split into shorter segments of a few minutes each."
Flexible use

- Both students and teachers used materials in several different ways
  - revision, filling in gaps in knowledge, introduction, replacement for a lesson or series of lessons, individual, pairs, etc

- To support flexible use, teachers wanted:
  - Clear description of possible audiences for ONL
  - Description of how ONL materials fit or augment the curriculum
  - Detailed index of the content, videos and PT anywhere activities
  - Examples or case studies showing how ONL can be used differently
A case study from Pilot 2

- Year 10 (14-15 yrs old)
- Level 1 to 2 BTEC students (beginners in networking)
- Used ONL with one student per computer, using headphones
- One lesson per week
- Studied at their own pace
- Teacher in class for support
Teacher comments

Engagement:
“The interaction is what the Year Tens like to do. They like to be engaged. They like to watch the video. They all had their headphones on and they were able to work at their own pace.”

Learning from mistakes:
“They need to make mistakes to learn. And student can get very ‘I’ve made a mistake, I’m not doing it again’. But because […] everybody was fully immersed in what they were doing, no one took any notice if they were doing it again.”

Range of ability:
“It did actually lend itself quite nicely to all abilities. And the fact that they could have a go. They weren’t frightened to have another go then.”
Teacher comments

Peer support:

“And if one got stuck, then maybe a stronger student would have already done that and he’d go back and support the weaker student, so all of this peer to peer is going on.”

“The peer support was absolutely fantastic. You could see and you would want to encourage it. You don’t normally see that until Year Twelve or Thirteen. But because they were all doing the same thing at the same time, they all had the same information, I actually found that the peer support started quite naturally within the classroom.”
Student comments

“I believe it was a very good and informative course. However, I found the videos whilst informative where too long in certain places and the scripts were generic. Overall though, I enjoyed it.”

“hard to navigate but otherwise good”

“my experiences was helpful and very fun to do”

“it was a really good and helpful experience”

“preety difficult yo get my grips around the navigation on the site and some of the questions on the quizz were confusing to understand.”
Looking forward, looking back

What’s next:
- Publish on OpenLearn as free badged open course
  - open to anyone, anywhere, anytime
  - including assessment → badge
- Publish on OpenLearn Create for reuse & remix
- Promote to the community

Looking back
- Open educational practices more difficult than OER!
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