Empirically Evaluating Streamlined Technology-driven Orchestration

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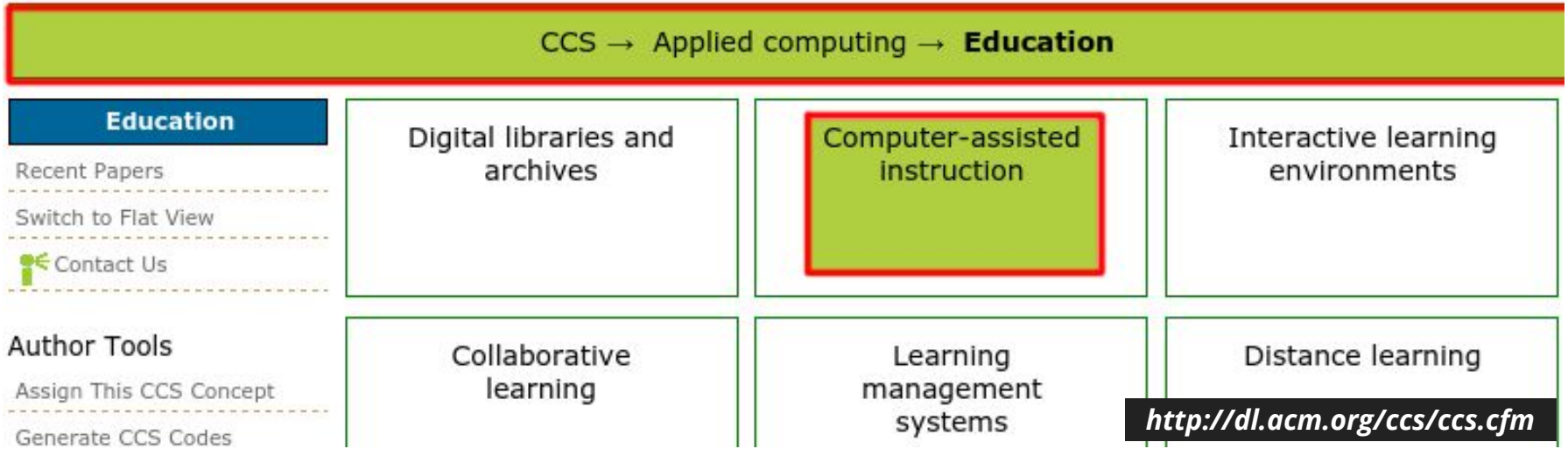

We are studying organised technology-driven orchestration of learning activities because we would like to understand how the explicit organisation of learning activities influences the effectiveness of educators in formal learning spaces.

Orchestration is extremely challenging and ad hoc

1) Argument 1: Orchestration is challenging
2) Argument 2: Orchestration is not standardised and thus ad hoc

Preliminary studies were conducted in order to understanding contemporary orchestration

1) **Study 1:** Meta-analysis of existing literature to comprehensively understand contemporary orchestration
2) **Study 2:** Expert reviews with teaching staff to explore tools used for orchestration
3) **Study 3:** Direct observations of lecture sessions
4) **Study 4:** Analysis of archival records in the form of recorded lecture sessions and screencasts

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Source: https://media.uct.ac.za/engage/ui

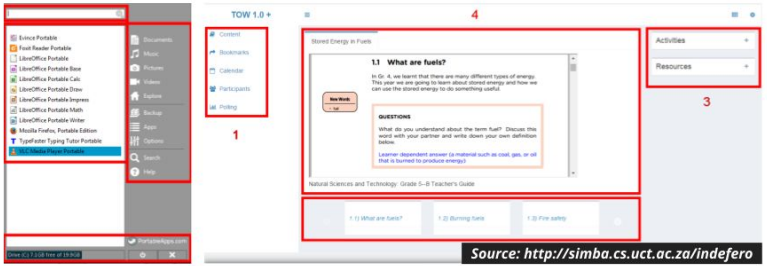
Orchestration can be streamlined through organisation

Thesis statement: Streamlined orchestration—attainable through explicit organisation of enactment activities using an orchestration workbench—could potentially make educators more effective.

The proposed approach focuses on three core aspects of orchestration

We have taken an experimental approach that involves prototyping orchestration toolkits using the proposed approach and evaluating its feasibility, effectiveness and impact on user experience.

Comparing ad hoc and organised orchestration



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Ad hoc vs. Organised Orchestration (T4E 2016).
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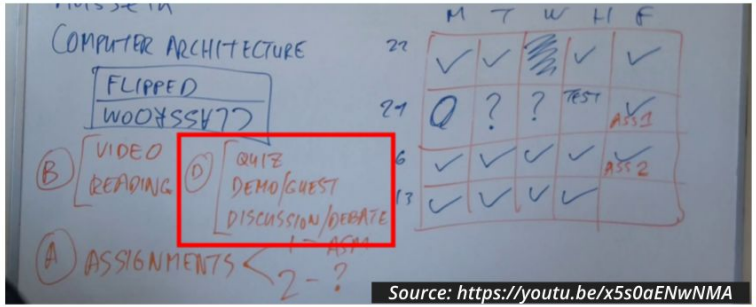
Orchestrating a Flipped Classroom



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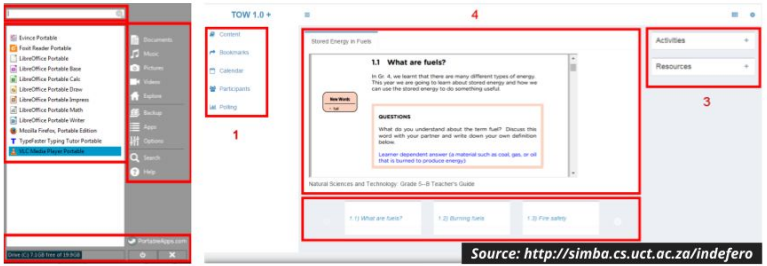

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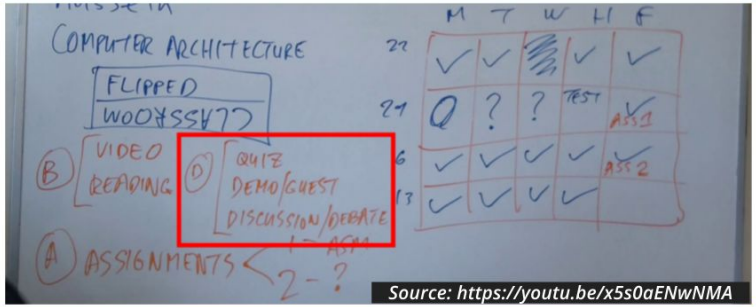

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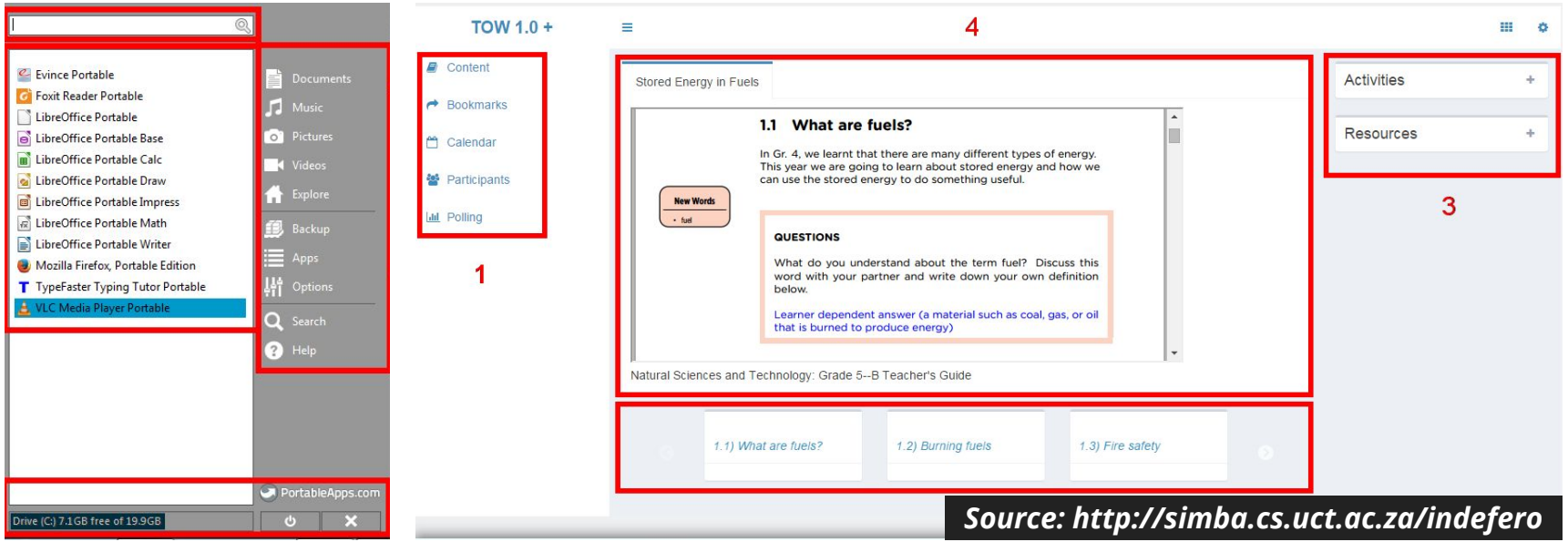

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Effectiveness and user experience of ad hoc and organised orchestration were measured

Within subject study design involving 61 participants from Cape Peninsula University of Technology recruited, with 55 of them completing all experimental tasks.

Evaluation aspects

- Task speed
- Perceived success at performing tasks
- Perceived user experience
- **Measurement instruments**: Time on tasks and AttrakDiff 2 questionnaire

Experiment procedure

- Random experiment blocks used for each of the two orchestration approaches
- Participants orchestrated activities on an “Energy” lesson, from a Grade 11 textbook

Orchestration with Workbench was faster and perceived to be more user friendly

Effectiveness and User Experience

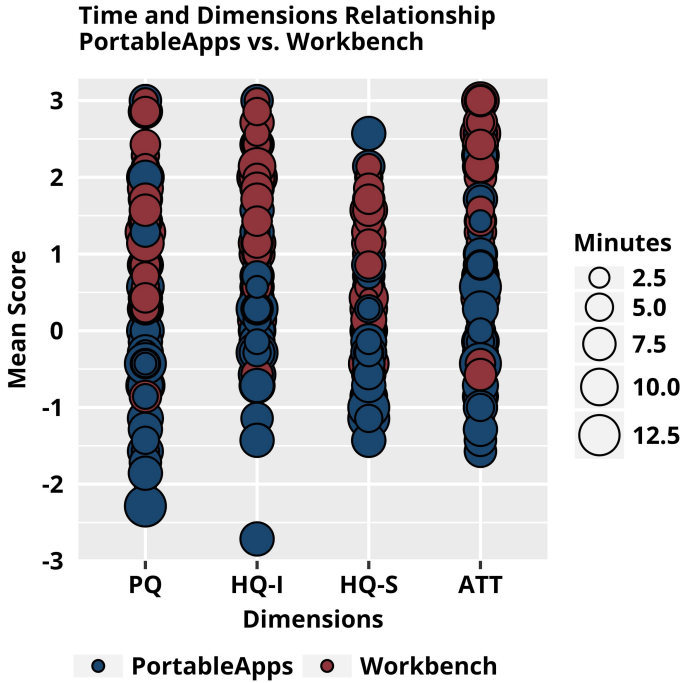
- Orchestration was 21% faster using Workbench
- Participants' perceived success at orchestrating learning activities greater using workbench

"If I were to do this with my learners I would definitely do approach 1" [Participant 06]

"It would be good if it was used as just one component of the lesson & not the whole lesson[sic]" [Participant 39]

Demographic differences & counterbalancing

- The influence of demographic differences resulted in minor variations from overall results.
- counterbalancing had a noticeable potential impact of approach complexity during transition



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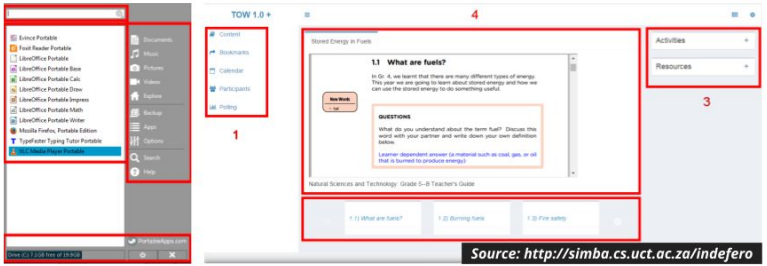

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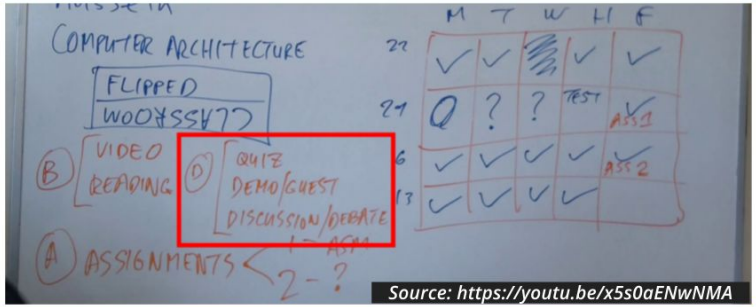

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Orchestration load and usability were measured

Laboratory study involving hour-long one-on-one sessions with 24 Computer Science Tutors for first year courses.

Evaluation aspects

- **NASA-TLX questionnaire** to measure workload
- **Perceived Usefulness and Ease of Use questionnaire** for measuring perceived usability

Experiment procedure

- Participants orchestrated activities from a tutorial session.

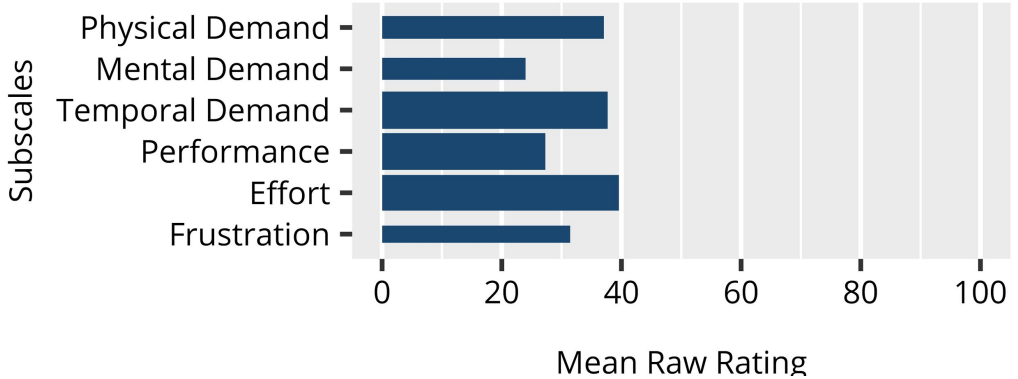
Toolkit exhibited acceptable workload and perceived to be easy to use

Orchestration load:

- Acceptable workload for all three scripting phases
- Resource Management required the most workload and while Activity Manage required the least workload

Usefulness and ease of use:

- Most participants perceived the tool to be useful (especially tutors for courses requiring more support) and easy to use.



A.	**Perceived usefulness**	**5.12 (1.14)**
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B.	**Perceived Ease of Use**	**5.80 (0.85)**
:	:	:

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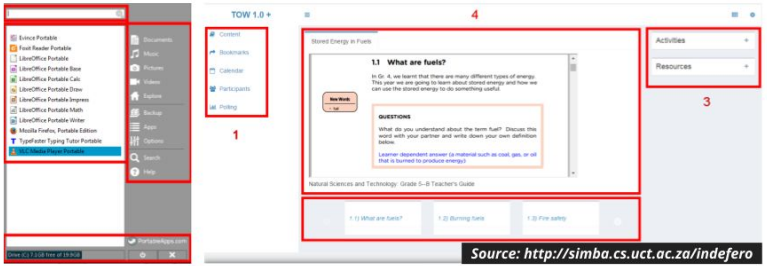

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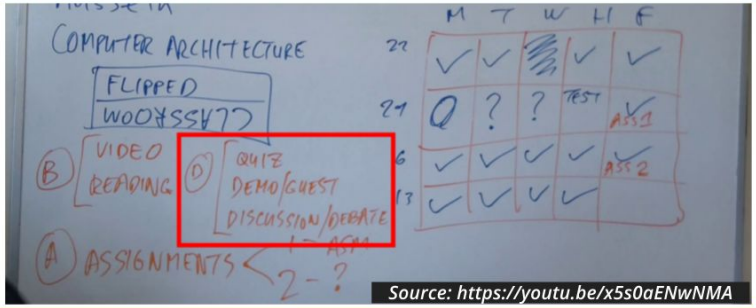

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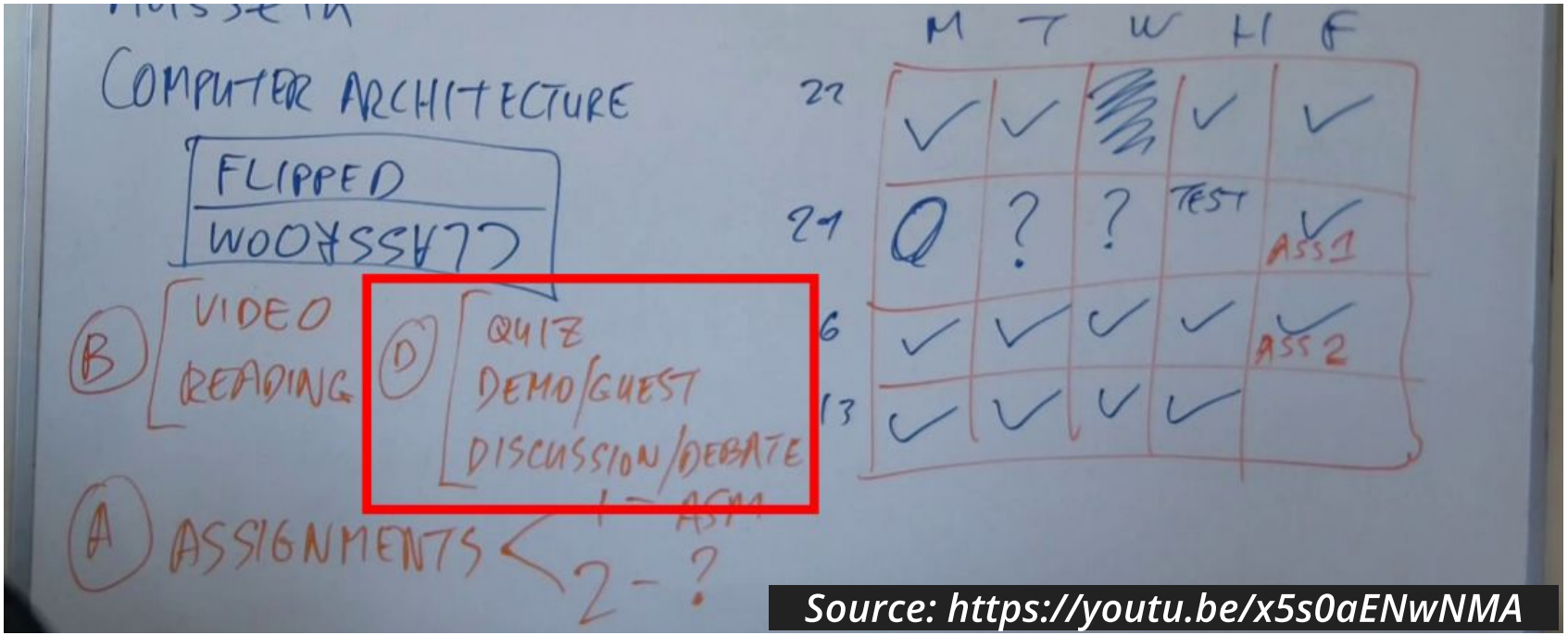

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Toolkit usage and learning experience were evaluated

Orchestration Toolkit used to orchestrate in-session activities, for a total of 12 lecture sessions.

Evaluation aspects

- Orchestration tools usage statistics
- Learning experience

Evaluation procedure

- Usage statistics for toolkit analysed using lecture recorded screencasts
- Direct observations made during lecture sessions
- Learning experience survey with 71 students conducted at the end of module block

Seamless transition between tasks and approach could potentially result in positive learning experience

Lecturer Orchestration tool usage

- Classroom observations and screencasts suggest seamless switching between tools.

"I did not really notice the tool"

"I found the classroom experience fun"

Learners' learning experience

- Results suggest approach could potentially positively impact learning experience.

Tool usage count and mean time		
Prototype	***10***	***00:30:31***
VideoGlide	***8***	***00:07:56***
Firefox	***1***	***00:21:29***
LO Impress	***1***	***00:38:26***
Evince	***1***	***00:00:50***
QtSpim	***1***	***00:12:47***
Robotic Arm	***1***	***00:01:24***
TextEditor	***1***	***00:02:07***
VirtualBox	***1***	***00:00:58***

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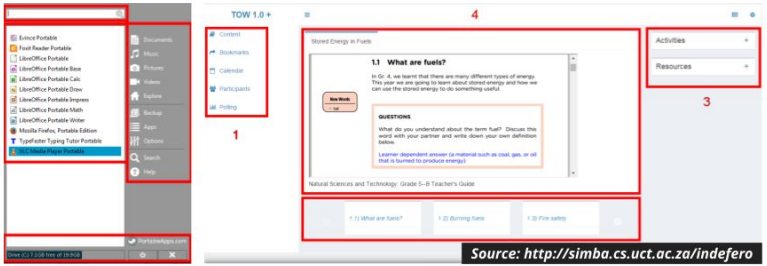

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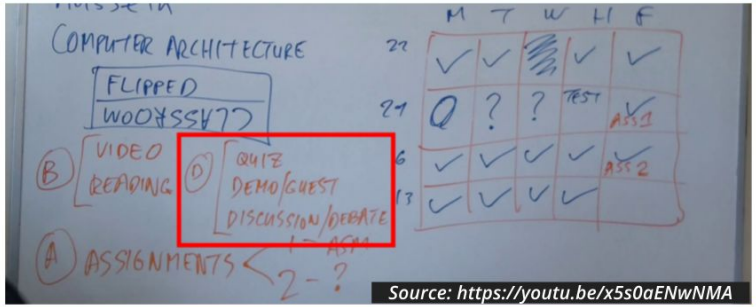

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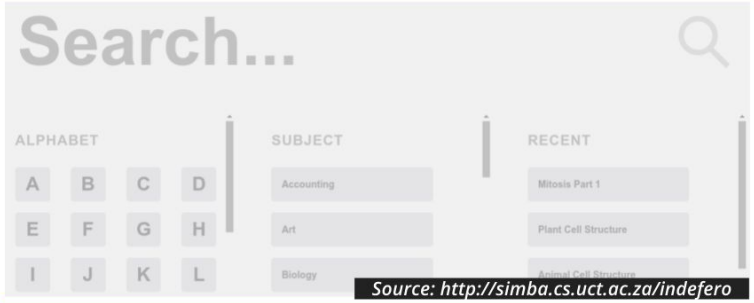

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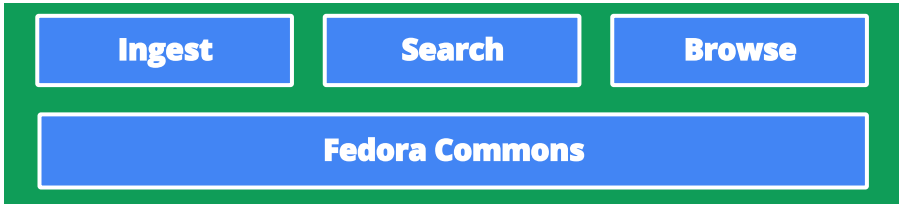
Reusable and sharable orchestration packages can be implemented as OERs

Offline Authoring Tool:

- IMS Global Simple Sequencing for sequencing
- IMS Global Content Packaging for packaging
- TODO: Sword protocol for remote ingestion

Scalable Repository:

- Content package discovery via search and browse
- OAI-PMH for metadata harvesting
- Sword v2 for remote ingestion



Summary

Four empirical studies conducted to evaluate streamlined orchestration have been presented.

- **Comparative analysis** to compare ad hoc and organised orchestration
- **Guided orchestration for peer-led tutoring** evaluating the three core orchestration aspects
- **Flipped classroom study** assessing approach in authentic educational setting
- **Reusable orchestration packages study** showcasing a practical usage scenario of the proposed approach

Thanks to all the study participants...
for making the studies possible!