

HPC Case Study for Adult Learning Principles



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1.0 The Importance of High Performance Computing

1.1 High Performance/Throughput Computing is of increasing importance. Datasets are growing larger than desktop systems can process them. Square Kilometre Array is an extreme example of a general problem.

1.2 Nascent research indicates that research output correlates strongly with availability of HPC resources. However my own research indicates that whilst availability is strongly correlated with research output, training is additionally also strongly correlated.

I am shocked – shocked I tell you - to find this correlation between training and usage.



2.0 Actual Metrics

2.1 In 2012 RMIT and La Trobe had almost identical compute time at the VPAC cluster Tango (1,729,837h for RMIT, 1,719,554h for Latrobe) from 2013-2014, RMIT's utilisation of the new cluster, Trifid, increased (to 9,760,919h), whereas La Trobe's increased to (4,964,297h). Course enrolments in the same period were 229 (RMIT) to 29 (La Trobe).

2.2 University of Melbourne had a minimal training programme. In 2015 the entire utilisation of their cluster, Edward was 4,930,340h. In mid-2016 a training programme was initiated, to help with the transition from Edward to Spartan and to improve HPC skills, with c140 enrolments in 2016, 220 in 2017. In 2016 the combined values of the two systems was 8,561,652 hours and in 2017 Spartan's utilisation was 13,411,804 hours.



4.0 Andragogical Principles and Challenges Opportunities

4.1 The situation of the adult learner is different to the child learner; they have a greater level of autonomy, independence, equal cognition, intrinsic rather than extrinsic motivations, greater personal experience.

4.2 Content needs to be organised in terms of objectives, timed, and revised! Content needs to be provided in as modular 'structural knowledge', with narrative, analogies, and humour. Provide grounding to a concept; facts and reasons provides understanding (*Verstehen*) which allows elaboration by the learner. When teaching HPC, emphasis must be on skill improvements rather than interface simplicity due to innate task complexity.

4.3 Delivery should make use of discipline-based learning styles. For computer use, connectivism (e.g., paired programming) and direct usage ("yield to the hands-on imperative"). Needs to be followed up with anonymous feedback, and proximal learning with a follow-up connectivist mentoring and outreach program.

4.4 Coordination between the University of Melbourne and Goethe University Frankfurt has noted that adult learner components (i.e., autonomy, personal experience, intrinsic motivation) varies significantly within the general status of advanced adult learner. At least part of this can be attributed to age and cultural diversity.

4.5 Disciplinary diversity is increasingly challenging as researchers may be more familiar with different disciplinary learning styles.

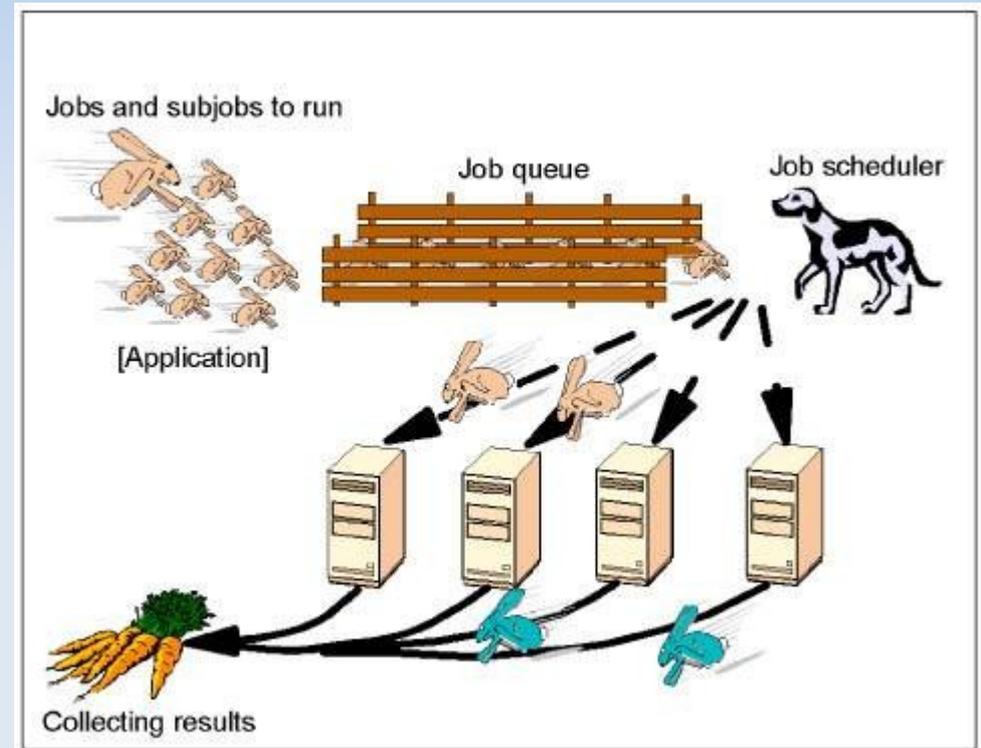
5.0 UniMelb Practise

5.1 Review researcher's experience prior to commencement of training, try to provide emphasis on material that is specific to their domain.

5.2 Ensure content provides theoretical grounding to architecture and historical community practise as well as immediate use tasks. Ensure content is structured, modular, and appropriate.

5.3 Delivery is a combination of presented grounding, guided exploration, individual experience, and voluntary paired review and assistance. Sequence of grounding, example, exploration, feedback and questions.

5.4 Anonymous feedback and review from researchers, ensure content availability and review. Opportunities for further assistance and mentoring.



5.0 International Comparisons

5.1 Independent variation in andragogical components suggests that a review of researcher's needs prior to attending classes and bespoke content will have the best possible outcome. Conducting highly granular course content can contribute significantly in this process. Integration of student management systems with learning systems an curriculum content.

5.2 The University of Melbourne runs general and specialist one-day training courses, structured from an introductory level to parallel programming and HPC systems administration, along with domain-specific courses orientated towards particular applications sets (e.g., neuroscience) or processing (e.g., GPGPUs).

5.3 European model is significantly more developed. They have regional, national, and international coordination of courses. Regional and national coordination depends on the political structure of the nation (e.g., Germany has regional and national coordination), international coordination through PRACE.

5.4 PRACE, the utilisation of MOOC environments for introductory material. Positive components: combination of video and text components, fine-grained content, active involvement by educators in learner forums. Immediate concerns: too high level, not enough hands-on activities, free-text Cloze skills evaluation.

5.5 Need to expand feedback including learners as partners in learning design, teaching governance, support (peer mentoring, community of practise), evaluation and evidence, learning environment. Due to time constraints, option for longer term summer school programmes (e.g., Le calcul haute performance au CEA)

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THANKS FOR WATCHING



& LISTENING PATIENTLY