ELIXIR.SI eLearning platform - EeLP

Brane Leskošek, Jure Dimec, Domen Soklič, Aleš Maver, Jan Jona Javoršek, Jure Kranjc, Peter Juvan
ELIXIR.SI, Faculty of Medicine Ljubljana, University Medical Centre, NGI-SI/SLING, Arnes

eLearning ELIXIR / GOBLET workshop, 16 Sep 2015
e-learning definition

• From the technical viewpoint e-learning is generally a flavor of **distance learning** that utilizes methods of **computer-assisted instruction**, **web-based communication tools** and **digital forms of educational resources**.

• Focus of this definition is on educational resources, which could be extremely heterogeneous:
  • from simple .ppt or .doc files to huge MOOCs (Massive Open Online Courses),
  • from static e-versions of school courses to highly dynamic lessons with knowledge assessment and adaptation to the student's level of knowledge.
motivation

As members of ELIXIR, an infrastructure for life sciences information, we wanted to

• simplify the use of bioinformatics tools, and
• simplify the access to bioinformatics tools, despite their non-trivial installation and configuration.
pilot project

As a proof-of-concept we used

• the tools for analysis of genomic data,
• an e-learning management system (LMS) as a standard platform for
  • studying the educational resources from the chosen domain,
  • studying the use of bioinformatics tools, and
  • production environment that could be used professionally.

A primary choice for the bioinformatics tools was Galaxy. Other systems are planned for the future, e.g. Chipster.
role of a learning management system (LMS)

A LMS functions as a front-end and user interface that
• hides the complexity of the Galaxy envelope, especially the inter-communication of tools wrapped by Galaxy;
• facilitates the upload of data to Galaxy and download of results from Galaxy;
• controls the management of files, and
• governs the user management.

Moodle was the LMS of choice for the task.
why moodle

Moodle Learning Management System is

• a robust and stable Open Source LMS with a vast user community;
• suitable for organisation of very different types of e-learning;
• a system with well developed user management and files management;
• the system that users in Slovenia are accustomed to – it is used for e-classrooms at most of faculties, all middle schools and many primary schools in Slovenia.
why galaxy

- Galaxy is a popular open, web-based platform for data intensive bioinformatics research.
- Galaxy has a large set of analytic tools which could be combined according to specific tasks.
- It could be deployed locally or in a cloud.
- Galaxy has a large, well-organised and active user community with numerous public and private installations.
- It is developed by the Penn State and Emory Universities.
**why chipster**

- Chipster is a package of analysis tools in bioinformatics available as a VM.
- Open source software for analyzing high-throughput data.
- Chipster GUI enables users to visualize data efficiently and share analysis session workflows.
- Chipster VM available in FedCloud Applications Database.
- Chipster is developed by CSC-IT Center for Science, Finland.
The development of the "Moodle-Galaxy" system consisted of the following tasks:

1. Galaxy installation and configuration, selection and inclusion of bioinformatics tools. Several possibilities for installation exist:
   - Galaxy installed on dedicated server (present-time solution),
   - Galaxy as a virtual machine snapshot, ready to be downloaded locally (short-term plan),
   - Galaxy used on a grid/cloud (short-term plan).

2. Installation of the referential genomes.

3. Moodle installation.
4. Development of Moodle modules for (background)
   • execution of analysis workflows and
   • manipulation of raw data and results files.
5. Authentication: AAI in eduGAIN confederation is used.
6. Authorisation is implemented at the level of service administrator. Access could be completely open or private.
The development of each use-case consists of the following tasks:

1. Development of a workflow (pipeline) of the Galaxy-controlled tools and exchange of data among them, tailored for the specific analysis task.
2. Testing of the workflow with real data and subsequent fine tuning.
development of use-cases

3. Mapping of the workflow into the bash script, which will be controlled by Moodle and will execute as daemon.

4. Wrapping of the bash script into the PHP envelope and installation in Moodle.

5. Testing of the process.
execution of use-cases

Each use-case is a representation of a real-world, often-executed bioinformatics task. We are planning to use these pre-prepared procedures

• in tutorials; this implies Moodle as the usual e-learning environment; access to the service and its results could be given to the groups of users which are undergoing the training;

• as a routinely used bioinformatics tool; this transforms Moodle into the production environment; access to the workflow instance is given to the particular researcher and only s/he sees the results.
what's the point of marrying moodle and galaxy

The advantage is in support for e-learning and professional work by the same environment.

• The bioinformatician is being trained in his/her art by the educational resources and tutorials in e-classroom.
• S/he can focus on domain knowledge because the technical complexities are taken over by the system.
• When s/he finishes the training s/he can further use the same system that s/he knows well, now for the real research tasks.
• Research life is a life-long learning and the e-learning flavour of the system is ideal for that.
short and middle term to-do list

• To expand the system with the **Chipster** package.
• To develop (use existing?) standards and API for structuring of results of analyses. We want them to be readable by humans and computers. Only by standardisation of results data their interoperability becomes possible.
• To offer adapted Galaxy (and Chipster) virtual machines in EGI FedCloud.
international use case IHTSDO e-learning
by David Markwell, Head of Education, IHTSDO

- [https://elearning.ihtsdotools.org/](https://elearning.ihtsdotools.org/)
- LMS Moodle turns out to be a great low cost solution
  - Cheaper than the commercial service we used before (and scalable without proportionate increase in cost).
  - More flexible and able to do most of what we need due to use of a range of free open source plug-ins.
  - In common with most open source it has some rough edges and bits that seem a little inconsistent in the way they work. However, once you are used to this the functionality is there.
- Total cost of ownership and the amount of time needed to spend on it is far far less than with the other LMS platforms.
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• In fairness the former platform Articular Online is probably a good place to start if you only have a few students but had very limited built in management of the course - no automated progress control so it all had to be done semi manually with downloads and uploads. I would never consider going back to it!

• The work of managing 1700 people registered and 700 actively taking courses on the Moodle platform is less than the work of 350 active students on the old platform.

• The assessment reporting is much more flexible and robust, we have far fewer issues reported by students ...

• Need (cost-effective?) expert for maintenance
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