Final report from the AAU funded PBL-development project:

Learner-Centered

Moodle Course Design:
Design Factors, Differences in Perceptions, and Best Practices

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With support from ITS

- Brian Møller.

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Background information – objectives, overview and project team

The project "Learner-Centered Moodle Course Design: Design Factors, Differences in Perceptions, and Best Practices" is one of AAU's PBL development projects. Here called the Moodle Course Design project or just MCD. AAU funded the MCD project from 1/1-2018 to 31/12-2018, and in the first months of 2019 the first version of a material bank are finalized.

As per the application document **the objective of the project** was to: "...*create a Moodle course containing multimedia resources demonstrating Moodle courses and activities as the best cases nominated by the students across study programs...* ", which could be used in facilitation of the professional development of teachers, for example at the University pedagogy course for assistant professors at AAU (Adjunktpædagogikum) or similar courses.

The planned activities was to investigate: The AAU students experiences (through a nomination survey); current AAU Moodle practices (through analysis of the nominated courses); and the AAU teachers experiences and strategies (through interviews) and to build the Moodle site based on these and on a literature review, "*demonstrating the use of priority features and explaining pedagogical and didactic factors*". In addition, and based on the analysis of the first activities, the team investigated what could be learned from more practical information (non-research-based papers). Consequently, instructional materials, as from the internet, and a visit to another university was arranged, for further inspiration (i.e. the Technological University of Delft - TU Delft). In MCD there was and still are **a focus on investigating how teachers can use Moodle for supporting their PBL activities.**

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The project results are reported via a Moodle site

As intended, the project team has developed a Moodle site, containing the results of the MCD project. The course is called "*How to do PBL in Moodle*". This Moodle course is a repository to be used as part of course, or in the facilitation of teachers design activities, when preparing courses. It is **not intended as a stand-alone self-study activity, but everyone is of course welcome to browse and hopefully be inspired, nevertheless.**

The Moodle course is found on the AAU Moodle site and require self-enrolment. That is, to view the course you need to click on the link below, log-in, and choose the icon: "enroll me"; (the link to self-enrolment may appear below the edge of your screen, so scroll down to it). Once you have clicked on the link, it will give you permission to see the course pages. This is the link:

- ## How to do PBL in Moodle

Please note that the site is in beta - the project team is awaiting approval for the publication of several video segments and thus final production of the approved videos and visuals that will make the site more visually appealing. Upload of the final materials are expected at the end of March.

Activities and main conclusions from the investigations

The MCD project team have performed the following activities

- A systematic literature review, that identified challenges, potentials and hints/tips for using Moodle in relation to PBL teaching.
- Four in-depth interviews with teachers, where the project team also investigated, in collaboration with the teacher, the Moodle design and use strategies.
- A survey with 345 student answers. The survey was a call for nominations on the students' best experiences with teachers in Moodle.
- An analysis of the nominated Moodle course rooms in order to investigate; how the courses are designed, why the students like these courses, and if the students feel they are lacking anything.
- Searching for online practical materials already existing at AAU and publicly on the internet, that could support AAU teachers, when using Moodle for PBL activities.
- A visit to and interview with another university for further inspiration about strategies when implementing and supporting faculty in their use of the learning environment (the chosen university became TU Delft).

These investigations provided information on a general level about the use of Moodle in relation to PBL teaching and on a more specific level, about the strategies of the AAU teachers and coordinators and the experiences of the AAU students and teachers specifically.

Results related to the specific empirical experiences at AAU

Not surprisingly, it was found that AAU students like a clear structure and a good overview. They also like when a teacher uses a varied range of Moodle activities from discussion forums, to quizzes or interactive videos and other resources (as further readings or online links). However, the project team also found that **some teachers are reluctant to use such activities** as they either feel that it is not relevant (do not at this point see Moodle as related to PBL), or they simply do not know the tools exist, or are unsure of how to think them into their existing practices. This could point to a **further need for professional development of the university teachers within this area.**

When students in the survey nominate their teacher(s) for their use of Moodle, the analysis shows that the Moodle rooms do not necessarily show advanced use of Moodle or use of Moodle in direct relation to student oriented PBL activities. The students are generally motivated by teachers, where there is a clear communication and organization of the course plan, which relates to the subject's learning objectives, and where materials, literature assignments or other activities are then explicitly and meaningfully organized according to this plan.

At AAU Moodle pages are used for both courses that contain smaller PBL activities and exercises and then for the larger semester PBL projects (of between 15 and 30 ects – the latter being the master thesis). In the semester PBL projects, there are many digital **tools that can support the PBL learning process and project management, and digital tools that support the PBL subject matter** (as when applying a sophisticated electronic equipment to measure health related issues, software solutions for learning programming etc.). However, there are not many signs of these activities in Moodle on the larger semester PBL projects, and probably knowledge sharing in between students and teachers in this respect, **primarily takes place at campus.** There are however, signs of information sharing on how to use for example subject matter specific equipment and software via power point slides, pdf's and other materials.

In the analysis of the many nominated Moodle courses and in the courses looked at based on the in depth interviews; it was seen that **in general the AAU courses did not use many activities that**

activate students and especially not student to student activities. Most Moodle rooms are used to give students an overview of the course they are participating in. Most Moodle rooms work as one-way-communication channel, providing materials from the teacher(s) to the student(s). Most rooms have a forum where the teachers broadcast messages to all students, but only a few rooms have a loop of communication, where students can interact with the teachers, with questions and/or hand-ins from the student, and the teachers' direct response and evaluation hereon. Hardly any rooms, have collaborative communication patterns, where students can answer other students' questions, comment, have a dialogue or give feedback (as in peer evaluation) etc.

However, most AAU students are fulltime day students, who come to campus for many hours, almost every single day, also during PBL semester project work. I.e. one of the reasons for the non-student-activating Moodle sites, could be that most of the classes and most of the teachers meet on a regular basis. Even if there are no attendance requirements, the motivation, engagement and activation of the students both individually and in groups, is seen as part of the didactical/pedagogical plan for the teaching on campus, and thus not necessarily an activity, which is deemed a necessary activity in Moodle. **It can be difficult for some teachers to see how Moodle based PBL activities can supplement classes that already meet frequently.**

As a result, the project team **looked for materials and developed a couple of videos and texts, that show how to utilize specific Moodle functions and tools for student-oriented and PBL activities, including** blended learning formats and digital supported campus teaching. Some materials link to already existing internal and external AAU sources, others, like the developed videos draw on experience from the project teams own use of PBL-supporting activities in Moodle, in blended learning and teaching in campus settings. These materials are and will be made available on the "how to do PBL in Moodle" site. Though given the projects time- and resource frame, only the first set of productions have been made, and **the Moodle course can be viewed as a first version, which can be evolved,** or linked to from other internal AAU resources in the future as well.

Furthermore, though many nominated courses had few student-activating and PBL-related activities, **the students clearly pointed to those courses where teachers go the extra mile in their Moodle use. There were 8 teachers that were nominated 5 times or more.** The Moodle website from the MCD project among other things provides **inspiration from those 8 nominated AAU teachers, with direct links to the actual Moodle site, enabling other AAU teachers and AAU coordinators to view these real cases from within the university own context** (done so with permission from the nominated AAU teachers).

Results related to the literature review

Two types of searches were performed, **a library database search using ProQuest, and a google scholar-based search using Harzings PoP (Publish or Perish) software. For the review to be useful for AAU teachers today, the included papers had to contain up-to-date research, which investigated newer versions of Moodle. The systematic searches were therefore restricted to the last 5 years, from 2013 and forward.** This was also done with the intention of keeping the review to a manageable size, given the MCD project size and timeframe.

It turned out that there were only a few research-based papers with concrete examples on the relation between Moodle and PBL. That is, there are several papers investigating Moodle as a technological enhanced educational tool, but almost none with the specific purpose of investigating PBL use in Moodle. Likewise, there are many papers on PBL and university teaching, higher education etc., but again not much on the practical concrete level on design and implementation in Moodle.

The analyses are finished, and the project team are in the process of writing this up and submitting a report and paper on this project, including the literature review. Once reviewed, accepted and published the project team will provide a URL to this, for those, who are interested. T**he following results of the review are thus for internal AAU viewing only and does not yet include the actual references to the literature.**

Challenges

- Students are often not content with Moodle when they commence the use of it – however, the more they use it the more they get use to its structure and functions.
- **Moodle is often used as one-way communication** – from the teacher(s) to the student(s). If teachers use Moodle in e-Learning settings, with little or no face-to-face interaction, it becomes difficult for many teachers to find suitable ways for receiving contextual and subject matter feedback from the students, and the nonverbal feedback is lacking.
- It is **difficult for teachers to define and structure project specifications online, and to engage students in the online activities, and consequently difficult to follow the students' progression in the PBL projects.**
- Similarly, the students find it challenging to collaborate online, and to find ways of asking teachers for help / guidance / supervision.
- Some researchers define **the existing Moodle cultures as being prone towards uses as content silos that promote teacher-centric-pedagogies**, and not collaborative learning and project work strategies.
- There is **a need for more training for faculty**, and onsite support is important for both students and teachers.

Potentials

- The results of some of these studies show that **Moodle can support students' learning considerable, also when PBL pedagogies are applied,** if the teacher act as a facilitator of a learning space, applying a democratic learning approach, with students identifying and forming their own work.
- **If teachers master the design of and engagement of students in online activities, then Moodle can support students in their reflections and provide teachers insight into the students' progression.** Perhaps even more so than when the students partake in traditional groupwork. This would require the teacher to be present in Moodle.
- **The use of LMS' for PBL activities can be more flexible, and traces of the collaboration can be seen long after it ended,** and comments, discussions etc. can be viewed / reviewed and commented on.
- The students have easy access to teaching materials, and it appears that the more the students use these, the better the grades. The studies that found these results, seems to be in PBL projects, where the teacher defines the problems and methods used. In AAU and the PBL semester project, students define their problem themselves, find literature etc. Studies that report on these forms, do not specifically and statistically discuss grade levels. However, at AAU, there are also many courses that do not directly apply the large scale PBL thinking, but supplement the work of the students with smaller predefined PBL activities, and results of these studies may apply there.

Hints and tips based on the review

- Students should have access to Moodle (materials, assignments etc) before, under and after the teaching period. There may be some materials, such as slides or weekly assignments etc. that are uploaded as the course progress, however the t**eaching goals, project information, course structure, dates and deadlines needs to be communicated clearly and preferable from the beginning** (or at least stated when this information will be given and where).
- **Teachers need to design the Moodle rooms in a way that it opens up for the possibility of tracking / getting an idea of the students' progression in the projects,** and to be able to give them feedback. It may also be an **advantage if students can provide each other with feedback and learn from each other's writings.**
- The study in general and teachers specifically could try to **communicate a sharing culture**, rather than enforcing a competitive environment, for example by making hand-ins visible for fellow students (as opposed to invisible from student to teacher hand-ins) – and at least occasionally, **use peer feedback and peer communication online**.
- **When activities take place online, it is important that there is a facilitator present to support and move the activities in the direction wanted** – as for example taking an active part in the students' discussion forums. This also provides the teacher(s) with insights into the students' progression.
- **Teachers could plan presentations / introductions etc. in Moodle rather than in class -** where time can be used for academic discussions instead. For example, some studies point to the use of video presentations, which is already used to a large degree in the flipped classroom thinking. However, this can also be done in a peer-to-peer thinking, by letting the students prepare the videos themselves (for example each group make a small panel like recoding of discussing the concept present in the readings). This **may also supports students' who favor a visual learning processes and support students' reflection and academic thinking** about a subject or paper more than when writing notes.
- Teachers need to foster an open dialogical tone, where students feel they can give and receive feedback, build on each other statements, and come up with wild ideas**. An important aspect of this is for the teacher to be equally explorative in her/his approach.**
- Moodle supports various kind of tools, and it is relatively straight forward to link to other tools from within Moodle. **Teachers could use some time to explore the possibilities in Moodle** that best support their teaching, e.g. perhaps quizzes for training specific and new terminologies, or wikis and blogs for where the student can share additional literature, YouTube videos, or link to real-life examples related to the subject etc.
- **When using external apps and software, the LMS/Moodle provides a starting point,** as the students are divided into classes already, and no one needs to think about how to channel everyone to the right place in the external context. This is in particular useful, when collaborative tools are used, as writing in google docs or microsoft onedrive (which AAU has license to for both students and staff), for video conferencing etc.
- **When students get to choose their own tools when solving PBL exercises, writing PBL projects etc. this may be motivating and make the students' take responsibility for their own process. However, it can be difficult for teachers to facilitate and share experiences in-between students** when applying many different tools. Also, there is today a relevant GDPR issue to contemplate depending on what the external resources are used for.

- Depending on the nature of the course and the PBL project, it is recommendable that **teachers give the students an opportunity to be co-designers of the Moodle space. T**his may increase motivation and use of the materials and tools applied in the specific co-designed Moodle course.

Which topics does the "How to do PBL in Moodle" site contain?

The Moodle site "How to do PBL in Moodle" includes results from the investigations as well as a number of materials that demonstrate the pedagogical and technological aspects of the Moodle functions. These are here seen in the quick navigation window from the site, copied in below:

Research results	Experiences from TU Delft Holland	Flipped Learning	Forums	Pictures	Database and Glossary	Feedback
Inspiration from teachers at AAU	Wiki	Journal	Assignment	Quiz	Literature	Facilitation of online meetings

What now – recommendations for the near future

The analysis of the empirical materials in the MCD project shows that many AAU Moodle sites do not use student or PBL inclusive activities and are instead content holders. As the previous pages show, there are both potentials and challenges when applying PBL activities in Moodle. If teachers feel competent using Moodle tools, and can see a meaningful strategy for using them in their own teaching, then **Moodle can work as supportive of the overall learning approach, and the Moodle pages can work as a place that provide a meaningful space for the students PBL activities.** The Moodle site "**How to do PBL in Moodle**" is one part of such a strategy, with the intention to be a tool used in the professional development of university teacher and for the facilitation of AAU teachers designing for PBL activities in Moodle. However, **right now this is a first version.**

The various subjects could easily be expanded and enhanced. For example the project team envision that **small interviews with AAU teachers,** would be an asset to include in the near future. It seems to work so much better when co-workers in the same context as one self, discuss their issues and solutions in a "down to earth useable manner". This could for example be done initially with the 8 nominated users. Perhaps having a yearly nomination is also worth considering. Similarly, establishing an activity that facilitates teachers to write ultra-short posts as – "this is the approach, app, video…, I have used for this subject xxx and the experience was…", and then allow for sorting or filtering according to subject matter and it pedagogical tool / approach used.

The developed Moodle site in this MCD project is a content holder, intended as a pool of resources. **It is therefore preferable to apply the use of these resources into real courses or other pedagogical activities** (being in either complete elearning, blended or onsite learning settings). For example the university pedagogy course for assistant professors at AAU / adjunktpædagogikum, could be a natural anchor for such pedagogical activities, as they focus on PBL based learning approaches. It is the intention of the MCD project leader to briefly introduce this year's assistant professors at the campus Copenhagen to the MCD Moodle (late March / April 2019). However, any suggestions for improvements that come from this may be difficult to develop and implement, if resources are not available.

Another question raised by the project is, that when many AAU educational programs are fulltime day studies, **it may not be a natural choice for most teachers to employ technological enhanced learning via Moodle for their PBL activities, if they see the students in real life.** So, the questions **AAU studies need to work on are, how to use Moodle for PBL in such circumstances, why and when.** It could be fruitful if the study and semester coordinators at the various AAU programs discuss the identified challenges and opportunities of this project and look into the findings of the empirical material, in order to investigate how future use of Moodle in a PBL perspective can be utilized in their specific program. Such future developments should rely on knowledge of the subject matter and close theory-practice relation, in combination with knowledge of it-based learning pedagogies and it learning design processes.

Finally, during the MCD project process, a number of local AAU developed materials was found on the use of Moodle - both technically (for example from ITS websites) and more pedagogically (in particular from previous AAU PBL development projects), which relatively few people seem to know about. That is, it is available but appear relatively unused and when asking colleagues and at teacher training courses, they too did not know about their whereabouts. It seem that they may be known to management, but seldom at the teacher level. This raises a need for discussing and deciding upon a strategy for how to assemble, communicate and make the most of such initiatives. Perhaps here, a collaboration between entities such as research groups within ICT and learning, and the new e-competence / PBL digital center and ITS, is the way forward.

Rikke Ørngreen, Copenhagen, March 2019