Hybrid Collaboration Patterns

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Hybrid education takes a more holistic view, taking the diversity of students into account and broadening the scope of their active participation. Collaboration plays an important role in education, as students learn to position themselves in a group, become more critical, and explore different ways to interact. More importantly, students enjoy collaborative activities that motivate them to learn. In this paper we describe five patterns that support collaboration through a hybrid approach: HYBRID CLASSROOM DISCUSSION, RAPID DISCUSSION, RE-MEDIATION, STUDENT SHARED RESOURCE SPACE, and COLLECTIVE ANNOTATION.

Categories and Subject Descriptors: K.3.2 [**Computers and Education**]: Computer and Information Science Education —*Computer science education*

General Terms: Patterns, Hybrid Pedagogy

Additional Key Words and Phrases: Collaboration

Reference Format:

Köppe et al. 2018. Hybrid Collaboration Patterns – Proceedings of the 25th Conference on Pattern Languages of Programs, PLoP '18(October 2018), 14 pages.

1. INTRODUCTION

Hybrid education aims at dissolving dichotomies in education such as physical-digital, academic-nonacademic, online-offline, formal-informal, learning-teaching and individual-collective [Köppe et al. 2017]. It takes a holistic view and considers the diversity of students and teachers. In this paper we will focus on mixing the digital and non-digital world, and digital and non-digital artifacts. This mixed learning environment makes sharing resources simpler and more accessible and broadens the scope of active participation for students. Such an environment also addresses educational values such as self-expression (as contribution becomes both simpler and more diverse), openness, flow of activities (avoiding any seams between media), and inclusion (allowing everyone to participate).

This paper introduces five patterns of hybrid pedagogy which enable sharing between learners and educators. Hybrid pedagogy refers to a mixture of different learning forms. For example, a mixture of formal and informal learning, or a mixture of digital and non-digital artifacts [Cook et al. 2016]. A hybrid learning space enables different forms of learning activities, and merges the digital and non-digital world. While blended learning refers to a mix of online and offline learning on a tactical level, hybrid pedagogy puts this mixture on a strategic level [Rorabaugh and Stommel 2012].

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Moreover, classic blended scenarios think about online and offline as dichotomies—learning takes place either online OR offline (it's an exclusive OR). Hybridity means that both forms take place at the same time. Hybridity can also refer to other forms of merging different concepts into one. Communication is no longer strictly synchronous OR asynchronous because synchronous media (such as video streams) can be commented on asynchronously, while asynchronous media (such as a shared online documents) can be edited collaboratively in parallel.

Another aspect of hybrid collaboration is that it mixes solitary learning and group learning, the individual learning contributes to the group learning (e.g. through COLLECTIVE ANNOTATIONS or STUDENT SHARED RESOURCE SPACE).

The patterns have been mined at EduPLoP 2016. At this 4-day workshop we mined more than 90 patterns of hybrid pedagogy. All attendees had already stories to share about using hybrid forms of educations. Moreover we were working on new solutions. The patterns we found can be clustered into different categories. Köppe, Nørgård, and Pedersen (2017) have created a map that shows the different categories and their relations (see Figure 1).

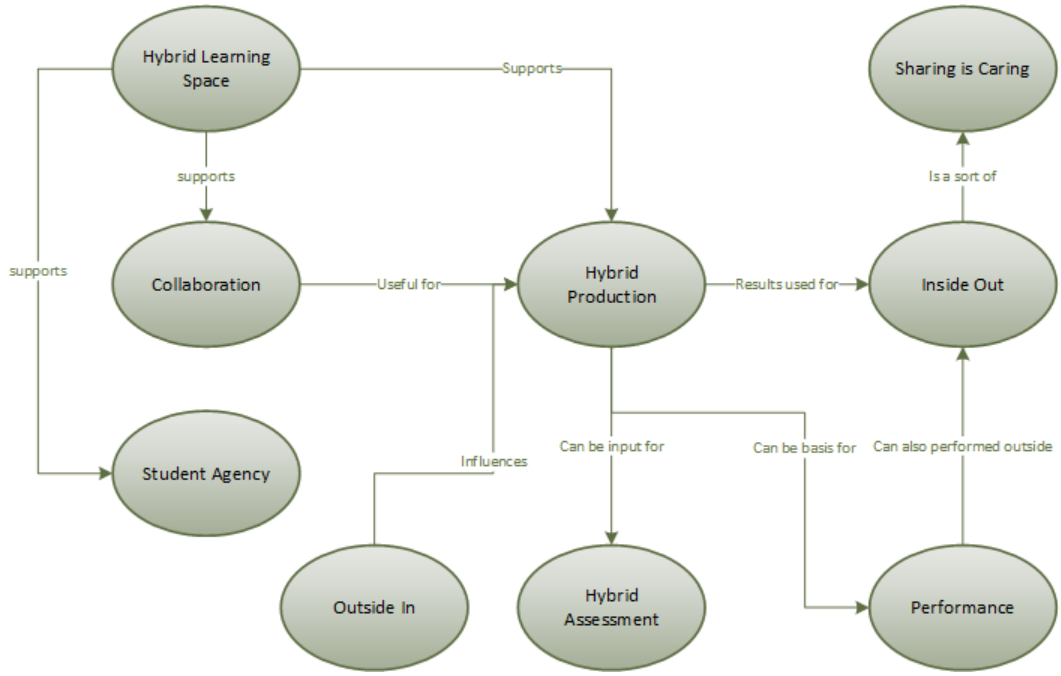

Fig. 1: Map of hybrid education pattern categories, adapted from [Köppe et al. 2017]

Hybrid Collaboration is supported by Hybrid Learning Spaces, e.g. having students BRING YOUR OWN DEVICE or with the use of LARGE INTERACTIVE WALLS [Kohls 2017]. Collaborating in a hybrid way can also be used for Hybrid Production.

This paper presents five patterns that focus on various aspects of collaboration and serve as connectors between hybrid learning spaces and hybrid production. HYBRID CLASSROOM DISCUSSION and RAPID DISCUSSION address how discussions in classrooms can be enhanced by adding hybrid elements. RE-MEDIATION describes how changing the approach for a task can open new opportunities for learning. STUDENT SHARED RESOURCE SPACE and COLLECTIVE ANNOTATION focus on the collaborative usage of resources. Applying these patterns does require some more preparation time (e.g. as the technology used needs to be configured), but once the preparation is done no extra effort is needed for their application.

All patterns were successfully applied in the context of higher education. However, none of the aspects of these patterns are specific for higher education, so we assume that they also are applicable in other educational contexts such as primary or secondary schools.

The following table provides an overview of all patterns:

Pattern Name	Summary
HYBRID CLASSROOM DISCUSSION	combine different technologies—analog and digital—for use in the discussion. Allow students to take the center-stage by giving them access to different technologies and drive the discussion. Act as a guide to help maintain the focus.
RAPID DISCUSSION	Open an ad-hoc discussion using a collaborative medium to break down hierarchies.
RE-MEDIATION	Ask the learners to do something somewhat familiar, but in a different way or through a displaced or refocused lens, in order to promote more reflection on what they're doing and critical inter/action through playful confrontation with unexpected opportunities and challenges.
STUDENT SHARED RESOURCE SPACE	In order to promote ownership of resources and have students make experience with looking for resources, provide a space where they can share resources and have experience of doing non-textual literature searches that are meaningful.
COLLECTIVE ANNOTATION	Have students in small groups or in a class annotate and write comments on the same texts, videos or pictures.

2. THE PATTERNS

PATTERN: HYBRID CLASSROOM DISCUSSION

Combine different technologies—analog and digital—for use in the discussion. Allow students to take the center-stage by giving them access to different technologies and drive the discussion. Act as a guide to help maintain the focus.

You are teaching a class and want to facilitate a classroom discussion or you are having a classroom discussion, but experience little to no active participation or the level of activity deteriorates rapidly. Technologies, both digital (interactive whiteboard (IWB), students' BRING YOUR OWN DEVICE, a DEVICE CABINET etc.) and analog (paper, sticky notes, card sets with e.g. concepts etc.) are available.

Students may feel restricted or less motivated to share their ideas in a discussion when the teacher controls the resource used for sharing information such as an interactive whiteboard or sticky notes.

There is a hierarchy in the roles of teachers and students that makes open discussion difficult. Teachers usually try to summarize learners' input and structure the discussion by interpreting, commenting, sometimes even paraphrasing the answers of students and writing on the IWB (e.g. using COLLABORATIVE SUMMARY). Students may feel inferior when their contribution is rejected or modified before it is accepted, that could dissuade them from participating further.

However, it will be difficult to maintain the focus of the discussion when students freely engage in their own individual activities during the discussion (such as writing on sticky notes, pair-interaction etc.).

Therefore, combine different technologies—analog and digital—for use in the discussion. Allow students to take the center-stage by giving them access to different technologies and drive the discussion. Act as a guide to help maintain the focus.

Giving students control over different technologies such as an interactive whiteboard and analog technologies like sticky notes can encourage them to engage in the class discussion. Use sticky notes in combination with input devices such as iPads and laptops to try to circumvent the inherent problems of certain technologies. If possible/available, let students use their own devices.

You may expect: The students take ownership of the discussion whereby they will engage with each others' arguments and direct the focus of attention away from the teacher. You may also expect that certain students will take the role of a mediator in the discussion, keep track of turn taking, and try to align different arguments. In the latter case, this should be honored but also directed if necessary, e.g. when the discussion moves away from the class' learning objectives.

However: Depending on the learning environment of the class and the motivation of the students, de-centering of the teacher can cause students to disengage from the discussion. Do not let this dissuade you. Instead choose another technology (or more technologies) or topic and repeat. This may be the first step in changing the learning environment of the class once they get acquainted to the new format.

Examples:
In a social science class, discussion is a central learning activity. Technical obstacles such as interactive whiteboards that don't afford collaborative, synchronous writing, and the classic arrangement of the classroom with the teacher in front of consecutive rows of students facing the teacher can have a detrimental effect on participation and level of engagement in classroom discussions [Rosenfield et al. 1985]. The example in the photos show a combination of different technologies that were utilized to bypass and circumvent the inherent obstacles. Graphical representations of the topic (political decision-making processes) scaffolds and structures the discussion. Sticky notes, pens, and a tablet with a simple sketch-app were used to motivate the students by letting them take control of the discussion. These technologies helped de-center the teacher and made room for students to leave their row of chairs and take part in the discussion. The role of the teacher was to observe and act as a secretary for students when they decided to have a heading written or moved around on the interactive whiteboard. Another input device (the tablet) was transformed to a remote writing station. The students wrote on sticky notes and placed them on the now vacant screen.

PATTERN: RAPID DISCUSSION

Open an ad-hoc discussion using a collaborative medium to break down hierarchies.

You want to stimulate a discussion in a larger group where all members can participate, maybe already as HYBRID CLASSROOM DISCUSSION.

Discussions in larger groups always have the chance of being dominated by some participants or discouraging participation when the facilitator imposes too many restrictions. Some members of the group who do not get the chance to speak might become less motivated to participate further.

On one hand, some people may think that they do not have anything to contribute to a discussion even though they actually do (e.g. by asking questions that trigger thoughts in a new direction). On the other hand, there are other people who think they have a lot to contribute and will quickly join the discussion, but neglect to give others the chance to speak.

Introverts may struggle to speak in front of a large audience so they may hesitate to participate in the discussion.

Therefore, open an ad-hoc discussion using a collaborative medium to break down hierarchies.

Fig. 2: Tools that students can use to express their ideas and drive class discussions (photo: Alex Young Pedersen)

Fig. 3: Students in a social science class who are using various technologies to discuss their ideas (photo: Alex Young Pedersen)

One way is to introduce a special hashtag and use Twitter as a medium (which would be an *open discussion* as others can see it as well, they could even contribute to it). Another option would be to use some available chat software only the group has access to (a *closed discussion*, only visible for the group). For example, the online tool Collabedit[1], which can be used for COLLABORATIVE EDITING of text documents (such as source code, summary lists etc.), also has a chat window which could be used for the RAPID DISCUSSION. Figure 4 shows an example where students were asked to sort programming languages according to their paradigm and the chat was used for RAPID DISCUSSIONS.

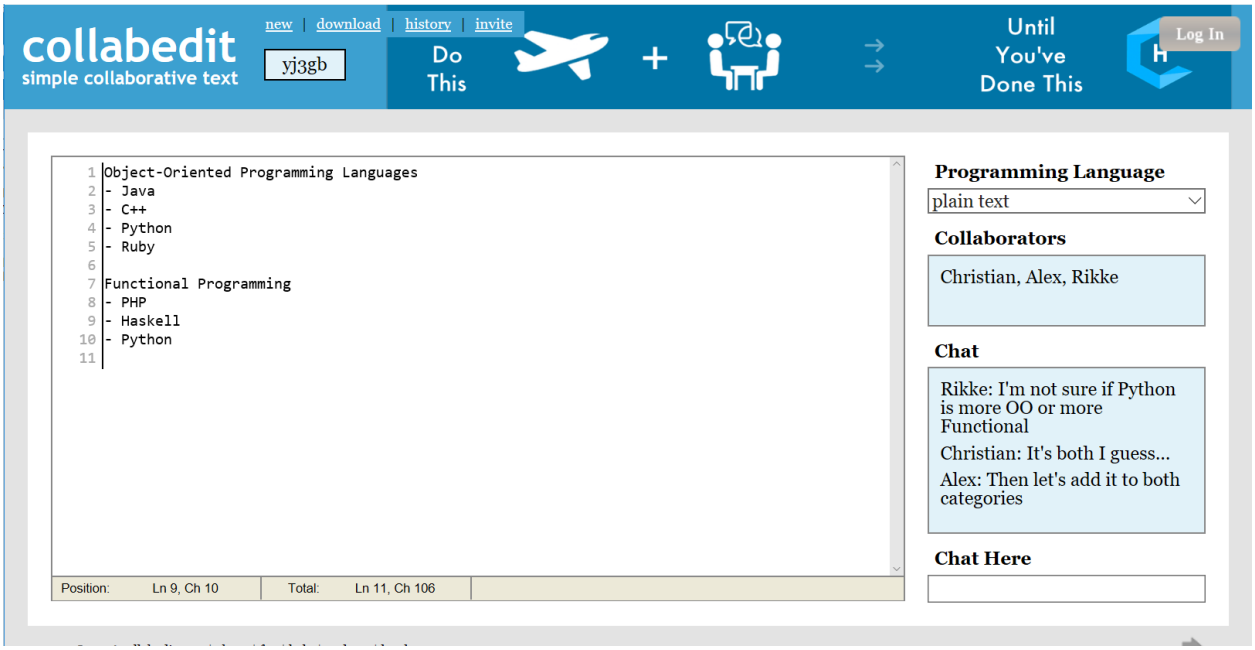

Fig. 4: Screenshot of student's discussion about an assignment using an online collaborative editing tool.

The solution requires that all students have (easy) access to the medium (e.g. Twitter accounts). Tools that do not require a login or registration (e.g. Collabedit or a shared link to an editable Google Docs document) enable a faster start of the discussion and can even be used ad-hoc if the teacher thinks this would add to an ongoing discussion.

RAPID DISCUSSION is a specialization of a HYBRID CLASSROOM DISCUSSION that provides a way to organize an ad-hoc discussion with all members of a group.

You may expect: The variety of discussion contributions (and hence the quality) increases. The same goes for the number of discussion participants wherein students who do not usually participate in the discussion join in due to the lower barrier of entry to the conversation.

However: The number of contributions is likely to increase and can become overwhelming and, therefore, chaotic. A good moderation of the discussion (both in class and an the online medium) is essential for preventing this and keeping some basic structure. There's also a chance that setting up the collaborative medium takes too much time or does not work well for all people in the group (e.g. because of limited internet access), which could lead to a lack of interest or

[1] http://collabedit.com/

attention of the group that requires significant effort to get back.

Examples:
Starr Sackstein describes in her blog[2] how she used Twitter Chats as complement to classroom discussions.

During lectures on Introductory Programming, Christian Köppe applied COLLABORATIVE EDITING *using the tool Collabedit. This tool also has a chat feature (as shown in Figure 4), which was used for* RAPID DISCUSSIONS.

PATTERN: RE-MEDIATION

Re-mediate the task and ask the learners to do something somewhat familiar, but in a different way or through a displaced or refocused lens, in order to promote more reflection on what they're doing and critical inter/action through playful confrontation with unexpected opportunities and challenges.

You are teaching a course where students are asked to do something they have done before (design something, write a story), but you expect a deeper level of reflection and some deeper-seated understanding of the structures and features of that task.

Doing the same tasks again by applying routinized or similar patterns over and over hinders deeper learning and reflection on the practice.

Sometimes when learners are asked to do things they have done before—write a narrative, design or program something—they resort to routinized patterns of problem solving, they don't leave their familiar and hence comfortable ground.

However, as a teacher you really like to promote more reflection on what they are doing e.g. what is an algorithm really, what are the caveats of design processes, what are the structures and features of good narratives.

Some tasks cannot be solved with usual solutions that call for exploring different approaches. This is a difficult skill to teach because students often struggle to think of new approaches, finding connections between them, and comparing them. Students often end up applying approaches that they have used to solve similar tasks without looking further.

Therefore, re-mediate the task and ask the learners to do something somewhat familiar, but in a different way or through a displaced or refocused lens.

Re-mediation is about doing something, somewhat familiar in a different medium or through a "displaced lens". For example, learners could be asked to explain a programming structure (case or loop) with Lego bricks or through acting out an algorithm as a group, thereby (re-)discovering the complexity of something known (a common approach in Computer Science Unplugged[3]). Writing a narrative could be altered by asking students to implement the story in Google Maps or history of technology could be re-lived by creating a 1980s living room. The point is to provide students with artifacts or demands that re-mediate the task and require students to re-think their usual way of addressing a task. In a way, you want to hinder them from applying standardized routine solutions.

The teacher can ask students to compare the different approaches they applied to promote the desired reflection.

[2] http://blogs.edweek.org/teachers/work_in_progress/2017/03/twitter_chats_compliment_class.html
[3] https://csunplugged.org/en/

You may expect: Students become aware that there are many ways to approach a task or problem. Applying new approaches stimulate deeper learning compared to usual solutions. It furthermore can be fun—and therefore motivating—to apply a new approach to a similar task.

However: Finding other approaches or task variations is not always easy and requires careful preparation. One has to also ensure that the re-mediated task (and the approach it requires) still has some conceptual familiarity with the original task, otherwise students will have difficulties with seeing the connections between them.

Examples:
In one example the students were trying to create awareness of the problems of waste in cities by collecting actual waste, arranging and exhibiting it as the skyline of the city in question. They collected the waste they found scattered around from the city center of Aarhus and arranged it in such a way that it shows the fast evolving silhouette of the skyline when being highlighted by a portable projector. For example the photo in Figure 3 shows the actual arrangement of the skyline of Aarhus – the second largest city in Denmark. The projection shows the town hall tower, the art museum ARoS and three tower cranes. The work was done by students under the supervision from a Danish artist.

Fig. 5: Student project using waste collected around Aarhus to recreate the city's skyline (photo: Alex Young Pedersen)

In a Dutch school, pupils who have read a piece of literature were asked to summarize the literature by creating a Virtual Reality (VR) scene instead of giving an oral or written summary. This required them to think explicitly about the relevant characters and objects in the literature and how they relate to each other in such a VR scene.

In a course on the impacts of science on society at the Utrecht University, the professor asks his students to act out the results of their exploration on the ethical issues of neuro-enhancement in a short drama play instead of having them writing a more classical essay [Verhoeff 2017].

PATTERN: STUDENT SHARED RESOURCE SPACE

In order to help students see the value of finding relevant resources and the benefits of working together, provide a space where they can share and collaborate in compiling resources from their own searches of meaningful information.

You are teaching a subject with difficult concepts or theories, and this subject is presented and discussed in various contexts online—for instance in videos and discussion forums.

Students take less ownership of the concepts if they are presented with a fixed list of texts and resources. Even though teachers carefully select resources they provide to the class, it may not satisfy the students' needs or support the way they learn.

There's no "one size fits all" for educational material. Even though most teachers try to address most students' needs, it's likely impossible to satisfy all of them.

However, not providing material and having the students find resources themselves is also not an option, because it's hard to ensure that these resources are relevant to the course objectives and support learning. Unverified resources have the risk of misinforming students and therefore developing misconceptions, so teachers provide pre-selected materials to avoid such problems.

Still, students are likely to look for further information or exercises on the course subject from the internet. However, students commonly keep this information to themselves and do not share it with other students who would have found it to be useful too.

Therefore, provide an online space where students are encouraged to share additional resources with their peers and articulate why these resources were helpful. Peers are encouraged to give feedback about how the resources helped deepen their understanding and how the concept becomes relevant/real.

What is important is the process of finding and exploring resources. The end goal is not to have a collection of resources. It is an opportunity for students to find their own way to understand difficult subject matters, and understand how the practice of sharing information is relevant to them and their own practices.

The online space should be easy to access and ideally be in line with students' daily social media routines. Students should take part in deciding which tools to use. Examples of online spaces/tools are: Google documents, Wikis, or a Facebook group. Some learning management systems (LMS) – such as Moodle or Blackboard – offer this functionality, but it only works if the LMS is appropriately used for supporting learning and not just providing content.

The space could be presented as an offer, not a compulsory task. As the teacher, you can frame a space for sharing by initially providing resources that demonstrate the use or presentation of the subject matter in forms other than text. The teacher is responsible for checking that the resources are relevant and applicable and giving guidance if they are not.

If there are too many shared resources then there is a high chance that students get overwhelmed. To further scaffold students' search, you can limit the search space using a custom search engine (CSE). The teacher then makes it possible for the students to access the resources that s/he has in mind, by foregrounding a list of websites and make them more likely to appear in the result list. The students still have the whole web at their disposal. Eventually, the students are engaged in further developing/refining the CSE.

You may expect: Students feel a greater sense of ownership of concepts and theories as they partly come from their own resources. Resources that a student finds effective for their learning may help other classmates who share a similar background and also struggle with the topic. Discussions cover subject matter beyond the teacher-provided material. Students get practice in finding literature resources. Furthermore, they learn to evaluate the quality of resources, which is an essential skill for lifelong learning. As a teacher you might become aware of valuable resources which you weren't aware of before. These resources can also be used in the next instance of the course.

However: There might be an explosion of resources. There is also a risk of finding misleading and poorly documented resources. That is why it is important for teachers to participate and moderate the activity. Some students will not contribute and just take advantage of the list other students created so they can read the literature and get a good grade. If the students do not use the shared space, it may indicate that the provided literature is sufficient and they do not have to find extra resources.

Examples:
In the part time semester on Object-Oriented Software Engineering at HAN University of Applied Sciences, a wiki-space was created as part of the learning environment where students could post additional resources, such as websites, tutorials, example projects, papers, books etc.

PATTERN: COLLECTIVE ANNOTATION

Have students in small groups or in a class annotate and write comments on the same texts, videos or pictures.

Reading texts or watching video—with the purpose of "learning through acquisition" or doing analyses—plays an important role in many learning contexts and institutions. You would like your students to get deeply into the texts by getting them to share notes and discuss. Also, you would like to see, where students have questions or comments directly in texts or videos.

Learning through acquisition by reading or watching a video is a solitary activity. Reading guidelines and questions on the texts can provide effective scaffolding, but the student sits alone with the text or video. Also, the very process of conducting an analysis of a text is a solitary process often taking place ahead of group or class discussions.

Even though there might be some reading (or watching) guidelines, the process of reading/watching is not very visible to the student, the group and the teacher. This makes it more difficult for improving or correcting this process.

Note-taking practices are important for students, but they can't be developed by artificial exercises or simple guidelines, they need to be practiced and improved.

Therefore, let students collaborate in annotating artifacts.

Students participating in group annotation give and receive some scaffolding in the process of understanding and analyzing the artifact. Annotations/comments/questions are connected to specific locations. The process requires:

—groups (large enough to provide support, small enough to require commitment),
—reading guidelines and/or an annotation task, and
—an artifact such as a text, video, or picture (the teacher could pre-annotate it to provide examples or ask questions).

The annotations could take various forms, such as:

—highlighting relevant sections and giving them a title,

—writing shared notes into texts,

—discussing academic texts within the texts themselves (scaffolded by the teacher),

—analyzing public discourse,

—describing patterns of form and content,

—tagging (e.g. for figures of speeches, frames in discourse, background assumptions), or

—using hyperlinks (e.g. to source materials or other helpful background material)

As a teacher, you should keep track of the annotations, provide meta-comments if necessary (on the way the annotations had been documented), ask questions if there are few annotations or if irrelevant annotations are made (in order to give more direction to the students), and encourage students to reflect on the annotations and discuss their insights to increase the value of their collective annotations.

There are different technological solutions that can be used for specific types of artifacts.

Videos

VideoAnt[4] is a stable and free solution for videos that are already on YouTube or Vimeo, or new texts that can be legally uploaded to YouTube. Once the teacher has prepared a video in VideoAnt, s/he can make copies to be shared with each group. Each member of the group can watch the video and add annotations to specific times in the video.

Text that is "reusable", e.g. in a word processor

A Google Document can be shared with a group of students using the option "everybody with a link can comment". Also annotation using hypertext and linking to appropriate resources and additional materials that may help students understand the text further.

Pictures

A tool for annotating pictures (and PDF-files) is Evernote[5].

Websites and PDF-files

Hypothes.is[6] allows to create groups for sharing annotations on websites and on PDF files. Evernote is also available for annotating PDF files.

You may expect: Students give and get better feedback. A common understanding is reached and agreement can be negotiated. Students learn to aggregate information and to focus on the relevant parts of an artifact.

However: This pattern can entail a change in the reading and note-taking practices of students. Annotating and reading annotations can be a disturbance, especially for autonomous students. Students have different and often very individual practices and habits for reading, annotating and taking notes. This pattern may very well interfere with these ingrained practices that can spur resistance. Some students may just read others' annotations instead of analyzing the resource themselves so they lose the opportunity to learn from the activity.

Examples:

Inspired by [Shaffer 2018] the use of hyperlinks can utilized to explore and evaluate information sources. They can also the used to create a context around primary source materials thereby enriching the content and helping students and the

[4] https://ant.umn.edu/

[5] https://help.evernote.com/hc/en-us/articles/209005587-How-to-annotate-images-and-PDFs-in-Evernote

[6] https://web.hypothes.is/

teachers to better understand the materials at hand. The use of hyperlinks can be done in a variety of formats and apps that support this feature. Social media like Facebook and Twitter being notable exceptions. The application of hyperlinks can be done by both teachers, students and collaboratively. In the case of a history lesson a primary source can be enriched with hyperlinks that can support the students comprehension and understanding of the text (see Figure 6).

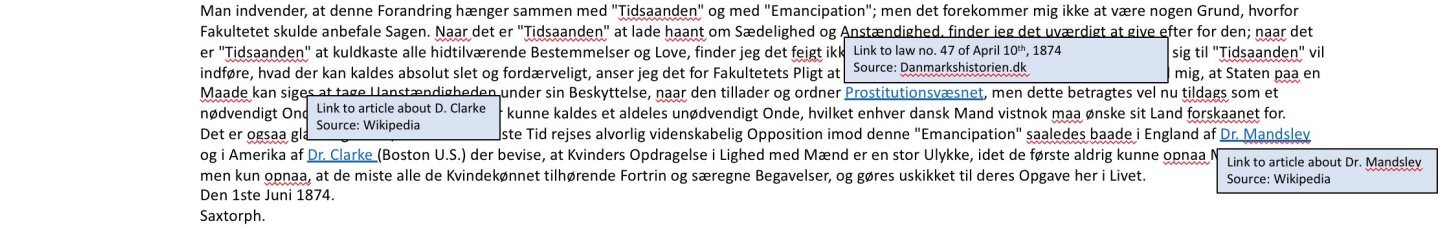

Fig. 6: An excerpt from the danish professor Saxtorph (1822-1900) where he makes an argument for not allowing female students entrance to the University of Copenhagen in 1874. The excerpt has been expanded with hyperlinks to sources that might help students gain a background knowledge of the historical context. Source: Screenshot by Alex Young Pedersen

3. SUMMARY

In this paper we described five patterns which can be used for adding hybridity to collaborative activities. These hybrid collaborations add new aspects compared to standard collaborative activities, thereby increasing the engagement of students.

The hybrid learning environment provides students with opportunities to learn how to work well in groups. Students develop their critical thinking skills as they find a solution to the problem. They also learn to communicate and find effective ways to work together to achieve their shared goal.

4. ACKNOWLEDGEMENTS

The initial versions of these patterns were written in a hybrid collaborative way during the 2nd EduPLoP workshop, therefore all participants contributed to them and are therefore acknowledged. We also thank our shepherd Jenny Quillien for her encouraging and insightful feedback. Finally, all members of the PLoP'18 writers' workshop have helped to improve this work with their feedback.

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Appendix

Table II gives an overview of patterns which are referenced in this paper.

Pattern Name	Summary
BRING YOUR OWN DEVICE [Kohls 2017]	Students use their own personal devices to contribute to activities both inside and outside of the classroom.
COLLABORATIVE EDITING [Köppe et al. 2015]	Use a tool which offers access to the same content for you and the students and collaboratively edit this content with the tool.
COLLABORATIVE SUMMARY [Köppe and Schalken-Pinkster 2013]	Create a list of covered content interactively with the help of the students. Write everything down where it is visible to all students. In case you've prepared such summary in advance, e.g. on a slide, show it after this collaborative activity and use it only as control if something was missing.
DEVICE CABINET [Kohls 2017]	Have a cabinet with standardized tablets or other digital devices: same configuration and same apps.
LARGE INTERACTIVE WALLS [Kohls 2017]	Have large scale interactive walls in your classroom or seminar room.