# *Entangled Education: Technology and pedagogy in universities as a mash up*

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***Abstract***
*The paper suggests that a pedagogical advance in universities could be to set up university courses where the digital is integrated more organically into courses and not seen as a separate thing. Drawing on work in postdigital education we suggest that higher education is still trapped in a binary where online courses are seen as analogues, and copies of an original face-to-face course. This vision is historically connected to the early days of the internet where online communities were seen as separate from face-to-face communities in the literature on the internet. The world has moved on, as technology has advanced, to see that every aspect of our lives involves a digital component and the simple separation of online and offline no longer fits with the entangled reality that people live. Many scholars refer to this moment as postdigital. And they are careful to say that postdigital does not mean that we are past the digital, but rather that the digital is part of all life. It is somewhat ironic that universities, in their practice, have not kept up with these changes though the scholars have. This means moving beyond learning management systems (LMS) and integrating numerous forms of digital technology. The LMS can still be part of a university course, but it is one digital tool among many. And the binary between online and offline would be challenged and the hybrid might be a more useful term than online. This could lead to an entangled education where space and time are transformed, as well as creating new forms of interaction and new avenues for communication in the learning process. In such a context, university students could engage actively in their own learning and be provided with spaces to integrate their ideas into the process. The paper shares some examples of these courses referring to them as experimenting communities. In these examples we show how the new forms of interaction and the transformed spaces in which these interactions occur increase opportunities for students to make sense out of the material they are learning and to see learning connected to real world problems and solutions.*

***Keywords***
*Postdigital, Experimenting Communities, Entangled Pedagogy*

## Introduction

Living our lives in the 21st century is in many ways dramatically different from how our lives were lived just 25 years ago and yet the essential elements; food, shelter, security etc. are still present and important, not only for our survival, but for our well-being. From an anthropological and sociological stance, we take a moment to pause on the extent to which digital technologies are present and meaningful in our lives and how our lives are enriched by the potential opportunities they offer. This brings us to the focus of our paper stimulated by the conundrum that the praxis of higher education does not mimic the real world. We propose that our lives are so inextricably entangled in digital technologies today that it is difficult to imagine living and learning without them (Fawns 2022). The term postdigital is an important way to understand education and the use of various digital technologies. Education is not only digital but is both analogue and digital at the same time in nuanced ways. The digital is only visible when not there (Negroponte, 1998) or it is simply a commonplace tool (Cascone, 2000). Or as Fawns puts it when discussing education: *...the digital makes up part of an integrated totality* (Fawns, 2019: 142). We agree that our lives are so immersed and enmeshed and entangled with and in the physical and virtual worlds that it would be folly to separate ourselves from the relationships and experiences that they afford. And, while we agree with the principles that the scholars who use the term postdigital are suggesting, in the mainstream of education online learning is still seen as separate from face-to-face learning.
When people in universities think about online learning and online courses, the dominant image that comes to mind is a piece of software referred to as a learning management system (LMS). It is a funny term, as if learning



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could be an issue of management and there could be a system to manage learning the way we manage inventory in a warehouse. Thinking about learning in terms of learning management systems is part of the continued expansion of instrumental reason, as the dominant form of reason in all aspects of life (Taylor, 1991). And it is not that LMS's are not useful pieces of software. There are many good things one can do with an LMS. Rather it is the instrument assumption behind what the image stands for, the form of social imagination that it encourages, and in fact the ways that these software packages are primarily used.

Most universities today see online learning as an analogue to face-to-face learning, and the LMS is the portal that allows one to imagine that the online can be an exact analogue of the face to face. Not only can it be, but it should be. The pandemic has underscored this perspective while it has forced us to recognize that there is a problem with the analogy. On the one hand, the pandemic has forced universities to scramble and create online versions of their courses for the periods of time where the university is in lock down. On the other hand, pre-pandemic, most universities saw their online course offerings as asynchronous versions of courses that were offered through the LMS. Now, a number of universities have an array of kinds of courses, e.g., remote synchronous, asynchronous, face-to-face, hybrid face-to-face, etc. What the pandemic has opened people's eyes up to is that there is no natural analogue from face to face to an online course. On the other hand, our imagination is still very limited (Taylor, 2005) . Mostly we see these forms as different kinds of analogues. We don't really understand the time and space warping potential of digital technologies. And thus, we are not able to fully take advantage of ways people could interact with each other using digital tools and infrastructure.

## How did we get here?

In the early days of the internet, people began to talk about online groups and communities. In the days of AOL and The Well, these spaces were thought of as the virtual world. And the virtual world was a mirror of the real world. The opposition between virtual/real became a dominant social imaginary in the 1990s and early 2000s. This was the world where universities began to think of online courses being offered through the LMS discussed above as virtual analogues to the real world of f2f classes. Many universities worked to parallel the f2f class in LMS's by designating some activities as "classroom" activities, while others were designated as homework. Some governmental bodies wanted universities to demonstrate that online classes had at least three hours of "class time" for a course that had the relevant number of credits (in the U.S. 3 credits). Other activities were considered homework. This imagining of online classes as an analogue, a shadow, of the f2f class created a world where there was a strict dividing line between the digital and the analogue. It also created some contradictions as people wondered if asynchronous discussions were classroom time, or homework time. While many would say we are more sophisticated than this now, it is still the case that digital technology is, in large part, used to create online classes that "parallel" f2f classes.

In *Coming of Age in Second Life*, anthropologist Tom Boellstorff (2008) used the terms virtual and real significantly differently. Boellstorff (2008) uses the term virtual and virtual worlds to refer to the online worlds that can be created with modern information technology and the actual for the face-to-face world we are all familiar with. He suggests that there is always a "gap" between these two worlds and logically if the gap were to disappear, then there would be no virtual world (Boellstorff 2008:19). While the virtual may approach the actual, the gap is never erased, and we will see that the gap is very important.

For Boellstorff (2008), both the virtual and actual are real. This is very important as much of the thinking in universities, as we have said above, does not see the virtual as real. By asserting that the virtual and the actual are equally real, Boellstorff (2008) is making an important ontological claim, which will have a significant impact on our understanding of social interaction and people's identities both within the different realms and across the gap. While Boellstorff (2008) was working in a virtual space (Second Life) an important implication of the point he is making is that the "real world" and the spaces of the "real world" can be modified by traversing the gap. One could easily imagine in a thought experiment that two groups, one meeting f2f, and the other group meeting online through any kind of messaging, zoom, group chat, could be partially or wholly overlapping. This hybrid space of the real world would multiply the opportunities for conversation as well as create overlapping groups, some of whom would know what others were doing at any point in time, others who might not. If it were a work group maybe the non-overlapping portions share summaries (reifications) of their interactions with each other to build toward some larger body of knowledge, products, etc. It is this kind of entanglement that we are thinking about in this paper and thinking of the kinds of social imagination that could go on in different entangled situations. Below we share some examples of the kinds of spatial, temporal, interactive and communicative hybridity that we are thinking about, and is in line with the way scholars are talking about the postdigital.

## Entangled education in practice

The following examples derive from a master´s, *ICT-based Educational Design*, that is situated at the Danish School of Education, Aarhus University in Denmark. It is mostly online and is fulltime for two years. The students are mostly living around the country and not close to the university. Some of the students live abroad. The teaching is organized around the notions of the experimenting community (Thestrup, 2013) and the open laboratory (Thestrup & Robinson, 2016). The experimenting community can be defined as a group of people who are together in experimenting with different kinds of technologies in pedagogical settings. These experiments might take place in an ordinary classroom or a workshop. The use of one or more technologies are not decided in advance but are constructed through trying them out in different actual contexts and reflecting upon the praxis. It is not a question of only using a technology as it might have been intended by a producer or an administration, but to ask the question on how the given technologies might be used and for what purpose (Dittert, Thestrup & Robinson, 2021). The open laboratory has to do with combining digital and analogue elements in the same pedagogical process (Fawns, 2019, 2022; Bayne et al., 2020). None of them are in principle given the advantage of leading or deciding how the combination should be carried out.

An example from the teaching is about eating a meal together online. Here the students are asked to work into groups and decide on which meal to prepare and eat. The students are not physically together in the same space. They are connected through zoom and OneDrive and communicate in the group both synchronously and asynchronously. Not only do they have to think about what to eat, they also have to think about how one can cook together and eat together and as a vital part of this process, they even have to think about how they should use cameras, mobile phones, tablets or laptops to make it possible for all to participate in the same process. In such a project, the technologies have to be used in new ways compared to having an online meeting where space and body does not really matter. The technology is challenged, but so is the meal. The students can´t just rely on the existing traditions for eating together. At the very least they have to adjust the concrete ways cooking and eating together is done. Digital and analogue elements are no longer self-evident for the students but have to be reflected upon to construct a new meeting place (https://itdd.au.dk/itdd-sider/).

Another example is even more complex even though it might be considered simpler. Here the students use a Padlet to upload and alter images. The Padlet is divided into sections, where different rows of images might be uploaded during the time the students are carrying out the task. They are supposed to upload images that have been created using GAI as one of their tools. When uploading an image, they explain a bit about it. Then they look at the other images already uploaded and react to them through uploading new images. The students are told to start a transformation process of the images already uploaded. They can change some of the content or some of the ways the image is expressed. They can use other tools to alter the images than what was used in the first image. The exercise described above can be further expanded in the deliberate use of other technologies. If somebody uploaded a photo and then somebody reacts through the making of a song inspired by the photo, then the transformation has changed even the media used for communication.

This can be expanded even further to a moment, where the new interpretation is a valid, independent expression in its own right. The following is inspired by a recent project in Denmark, where children in an afterschool club combined GAI and analogue materials (Lundtofte et al., 2025). This can for example happen through asking the students to make an expression in cardboard or clay and then take a picture of it and upload it. A house in cardboard for example is an analogue tool to build and play with locally and can be photographed and uploaded to the other participants to make a new version of in their time and space and use for their local playing. One can even take pictures of the local houses and alter them in GAI to upload on the Padlet and use the new versions to make new houses.

And to make it more complex but also more to the point: The houses made in cardboard need not to be exact copies of the houses on the Padlet or the ones generated by GAI and it need not be so, that the house produced in GAI is the first to happen. Each house might be an object to play with and simultaneously an inspiration to make a new one. Analogue and digital constantly switch places in the process but so does the process of at one hand being an independent toy to build and construct in itself and on other hand being a toy in exchange and constant reshape with other toys in other media and technologies.

The technology can be present in several ways. It can be all the way from an object which is made part of the given house like a mobile phone placed on the wall of the house with masking tape over filming the house while playing with it to using the screen as part of an inspiration to build a new house. All elements are possibilities in establishing a momentary entangled shape and order, which might transform any earlier shape and order to another. An exercise like this goes beyond a pure combination of elements or the investigation of possibilities not yet discovered. The possibility exists that the combination and the investigation starts to become a transformation into a new expression that is more than before. The entanglement might be obvious as one still sees the elements of the combination or all possibilities are being tried out. But there is also a moment, where the entanglement makes sense and creates a new house, that needs to be as it is. In terms of pedagogy and technology this means that the entanglement is as it should be in the given context. The students and the teachers reflect upon the concrete entanglement, that is more than the individual elements. It is changeable but consists of a number of needed parts to construct a situation, where relevant action and reflection is possible.

## The Mash-Up

To have a poem in an academic text might be unusual, but the following poem is here to explore the idea of entanglement in a poetic way and add to the many ways an entangled paper can look like. It talks about possibilities and sensations that might add to the discussion and the experience of being entangled personally and in education:

The Mash-Up

In between clear lines and deliberate dividing
The mash-up and the storm rule under the fingers of the students
The teachers are locked up in front of a screen, not seeing the movement
Universities are aircraft carriers with no planes

We are connected through dust and dreams
The Internet only the beginning of being a cyborg
Tech is in our blood, body is in our wires, eyes is in my head
We wear shoes and mobiles, screens and sandals

Look at me, balancing on a globe of mud and presence
I am here and I reach out to everywhere, while drawing and dancing
My fingers are clay and shaping the future of technologies
Pen, paper, cameras, apps, streets and mountains are all me

Notice the moment, when the digital signals turn into analogue skin
Notice the moment, when the local flesh turns into a global body
The students know where the gap comes from, but nobody cares
Education is combining any technology with any other technology

## Entangled processes Online

So based upon the above examples we suggest that the word entangled might give another idea of how digital and analogue can work together (Fawns 2022). As the model *Entangled Processes Online* below (Figure 1) demonstrates, is it at the same time possible to isolate a process as analogue or digital and let them intertwine - and this can as well be happening online. Workshop A, that in itself entangles digital and analogue, exchanges ideas, examples and suggestions to Workshop B, which in principle does the same.

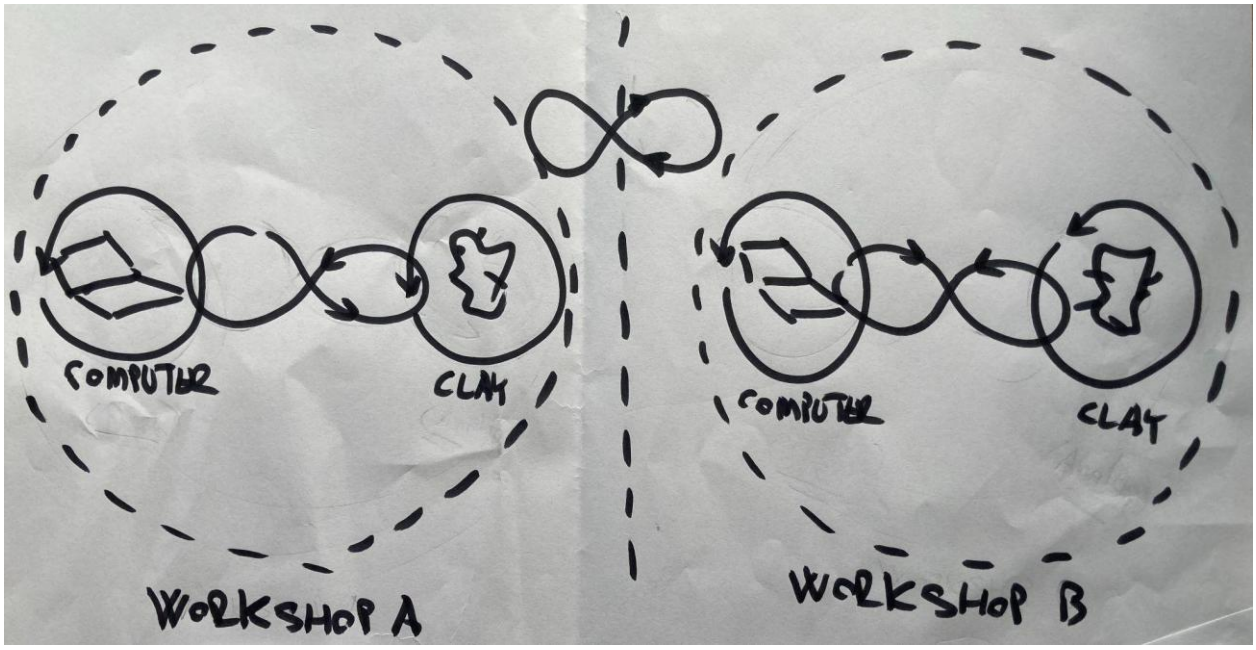


**Figure 1: Entangled Processes Online**

The term Computer is chosen to underline one practical demonstration of the digital but could of course be any other digital artifact. Behind it is what is considered digital. The term Clay is also used to demonstrate a version of something analogue but also to show a material that might be very changeable in terms of what it might be used to express and in what form, the process might unfold. But it could of course be any other material used in processes of change. Behind the term is what is considered analogue.

You could say that the gap between analogue and digital and the two groups operating on-line no longer is a necessary gap to follow, but one that can be formatted in different ways depending on the context and actual pedagogical situations, the gap is played out in. The entanglement gives the participants the possibility to create the pedagogical environment needed. The word entanglement comes from an entangled pedagogy, where the dichotomy between analogue and digital is disappearing. If the technologies in question in a certain context also are both digital and analogue, then the technologies are entangled as well. The consequence is obviously that one might need to talk about entangled pedagogical processes in an entangled education. As the model above suggests, there are already existing pedagogical processes and traditions, new or old, around using GAI or houses of cardboard. The new thing is a process, where it all might be connected and altered. The participants in these processes might need to be introduced to the very processes to be able to see them and change them. Exercises as the one described in this paper are suggestions to do so.

This next bit is about the dotted line between the two workshops in the model above. It is about characterizing this thin line as a meeting place and an online community. Such a community can be understood as a platform for creativity (Gauntlett, 2023). This means a place where participants can meet and be creative together. Such a platform can take many forms, including bridging between online and offline as it is formulated. A platform is not based upon being either or, but both depending on the context. It might be added that the two workshops connecting does mean either that everything happens only online or offline. It might be a combination, and then the idea of the entangled education can be connected to the idea of a platform for creativity. Such a platform makes it possible to exchange and share in the sense that the participants can show to others what they are doing, get ideas and inspiration, to connect and to learn from others. It is a place, where there is room for being seen, having a space for imagination. The dotted line between the two workshops is a place, where the infinite symbol exists alongside the infinity symbols locally. The two workshops can be their own places for creativity, but they can also be interlinked in process, where the participants in total might be inspired by someone somewhere else. The process might not be ended fast, as there are in this case, participants from two workshops to exchange together with.

It might be added as well that the exchange between the two workshops can be of an extended character and not only show images of each other's processes even though it might be interesting as well. The images that one shares, can be the very objective for the exchange. One might alter the images the other workshop sends. One might build digital worlds together like Minecraft. One might create files to use when 3-d printing in a makerspace. If the two workshops do not have the same possibilities in terms of materials, tools and processes, then the workshop might transform what they see and make their own version of these possibilities. One can be entangled in the sense that different versions of one element might exist at the same time but in different places.

Entangled processes have to do with the possibility to establish new ways to communicate locally, regionally and globally. A virtual version of an ordinary classroom or a makerspace does not do so, as it risks being stuck in yet another version of a traditional classroom. The term hybrid also risks to be just another version of an education that still separates processes. The university risks to stay in a pre-digital understanding of education even though it uses online teaching as part of what is offered to the students. Teachers and researchers so to speak risk shoehorning tools meant for online teaching into the existing pedagogical world and not one that matches the world outside the university. An entangled education can be understood as an open laboratory, that is basically open in several ways such as combining analogue and digital materials, tools, processes and traditions, but also connect people across the globe in processes of exchange and collaboration.

## Where are we going?

We have illustrated with the above examples how we could imagine new forms of teaching that mimic the entanglement of technologies in the real world. In order to do this, we now reflect on what pedagogies might support an entangled education. What is evident from the above examples is the relational elements that are involved. Not only are there relationships between the student and the material, whether it is the technology or the analogue material, but there are just as importantly, relationships between the student and their peers. The experimenting community that is established and supported through the processes illustrated in the diagram above are supported through a human-centered pedagogy that allows for diversity, equity and empathy. The goal is not to ‘be the best’ but to transform and to change. Here we mean understanding ‘who I am’ and ‘who I want to be’ as well as ‘what can I do with others’ to produce something that is of value. So the pedagogy that is central to this process is centred on creating something of value (Lackéus, Hyldegård & Færgemann; 2025). When something of value is created, sense is made, and it becomes meaningful. To design courses that have the goal of creating value is not easy and neither is it easy to participate in nor evaluate (Barnett, 2012).

It requires that the educator is explicit about the goals of such teaching and that experimenting and making mistakes are where development occurs. For many students, while the pedagogy may seem innovative and exciting, for others it is demanding and risky. If we are to support students in making their knowledge actionable (Barnett & Bengtsen, 2020) as educators we need to scaffold the teaching for meaningful learning by being explicit about i) creating value as a goal ii) how students will work together in authentic relationships iii) what they can do that mimics real world practices and iv) become change-makers (Robinson, 2020). Designing pedagogies in this way will move students from transmission of knowledge to transformation of knowledge and themselves as individuals, equipping them to become more at ease with the entangled lives they are living and going to live. And if our pedagogies are able to move beyond the binary of online courses and face-to-face courses, we can complicate the forms of communication that go on among students (and teachers) as they imagine new social spaces to operate in and new forms of interaction for learning and knowledge creation.

The very construction of a digital and analogue educational environment can support the development of a students' agency in a globalised world, that is more than an individual capacity for each student. This is called a relational agency, where students can act in different networks using different digital tools (Code, 2025). Drawing on Priestley, Biesta and Robinson's (2015) work on teacher agency, they argue that agency is always ecological, enabled and constrained by the structures, culture, relations and systems that teachers find themselves in. This work links closely to Code (2025) who points to the importance of the relational in agentic action that is influenced not just by human interactions but those interactions with artefacts and available resources. The individual agency still exists, but is also connected to a collective agency co-constructed through interactions with others, who might be part of other cultures or educational systems. The students are also required to obtain a proxy agency, when asking for support in an algorithmically mediated environment. This can be extended to a shared agency, as the

students are in situations, where they interact with both humans and non-humans actors. One can also talk about a spatial agency, where students know about different modalities and how to navigate between them.

The entangled processes online is a way of framing the relational agency in a very concrete way where the body and the workshop does play an important part. Online learning processes are more than writing together even though it is important to consider how writing can be understood in a global context as for instance an emerging text in the intertwine between the digital and material (Gourlay, 2024). The encounter between analogue and digital can be understood quite literally, as the differences between the two might exist, but can also be constructed in actual pedagogical formats, where the difference no longer is important to uphold, but the actual construction is important to experiment with, to test, to establish as a way of communication and production, to reflect upon and through this to learn from. What is digital and what is analogue is not a given and can be closely entangled. One must have a level of meta-learning, where one addresses the learning situation in itself and asks what oneself and the others involved in the pedagogical process are actually learning from the chosen way of constructing the pedagogical space (Fawns, 2019, 2022).

The ordinary use of the mobile phone and cooking in two or more kitchens online as mentioned earlier might change and influence each other to a new use of both elements, that is adequate in the situation. This given and ongoing construction, a new meeting place for the students involved, might in itself require meta-learning to succeed. The spatial agency is more than navigating between modalities and understanding them, it is also about creating new modalities together. The entangled processes online highlights the process of letting different modes meet in a new mode, which changes the existing modes. One area of further research interest could be how the students design the digital and the analogue to entangle into new emerging modes in actual pedagogical processes while supporting their learning.

# Conclusion

In this paper we have demonstrated how the digital can be used as a pedagogical part of an integrated totality in education. It is possible to establish processes, where the digital and the analogue are entangled to a point, where the gap between the two loses importance and becomes something one can format into learning spaces and include the teachers and the students in understanding the entanglement of our lives and how to engage in an entangled process using different modes of interaction, conversation, information seeking and problem solving. This includes the use of workshops online and it includes the process of constructing new meeting places together with somebody somewhere else in the world. The entanglement becomes an active choice, and knowledge turns into something that is being transformed by the participants themselves through a relational agency as they are transforming the learning spaces according to their needs. What is revolutionary about the digital is its potential to complicate space and time. This is particularly exciting for universities. As we have seen in our examples, the spaces for learning interaction are made more complex and more interesting for university students. University students can take charge of aspects of their learning and engage with real world contexts even while interacting with their “classroom” colleagues. This enriches the sensemaking process that is so critical for a university education.

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