DUT Guide on meaningful digital teaching-learning interactions

Maria Hvid Stenalt[1], Department of Culture and Learning, Aalborg University
Dorte Sidelmann Rossen, Centre for Educational Development, Aarhus University

Abstract

Digital teaching-learning interactions are never neutral. Rather, they involve a multi-way process with many interactants, motives, materials, and actions affecting students' sense-making. To make digital interactions meaningful on the students' part, this guide suggests supporting students' feelings of autonomy, competence, and relatedness. Based on research and experiences from practice, this guide provides six tips for educators on what to consider and how to plan for meaningful digital teaching-learning interactions in higher education.

Practical tips

1. Consider the constraints of the digital format
2. Balance time and purpose
3. Find the right technology to use
4. Include student-centred approaches (autonomy)
5. Scaffold student learning (competence)
6. Develop relational commitment (relatedness)

Introduction

Picture yourself as a student having to add your response to a five-minute digitally supported voting activity in-class followed by a joint discussion. Then imagine yourself involved in a fully online course where you have to write your response to a question in a discussion forum. Peers are expected to comment on your answer within a week. How would this affect your engagement and motivation differently from the first scenario?

Digital teaching-learning interactions are never neutral but are informed by and informing various aspects such as the students involved, their motivation, their perception of the other interactants, the technologies used, and how they are used. To that end, a critical part of making digital interactions meaningful for students is considering the interplay between these aspects.

This guide describes six tips for integrating digital interactions meaningfully in higher education teaching and learning. In this guide, *digital teaching-learning interactions* refer to 'the interactions and processes in which

[1] mariahs@ikl.aau.dk

academics and students engage in relation to the curricula' (Ashwin, 2008, p. 151) that make up the particular part of the educational programme involving the use of digital technology. For example, digital technologies could be learning management systems, student response systems or online workspaces for brainstorming, collaboration, and feedback. Meaningful interactions are underpinned by motivation theory and refer to interactions that offer students a feeling of autonomy, competence, and relatedness (Ryan & Deci, 2000). *Autonomy* refers to the feeling of volition and the desire for self-organised experiences and behaviours. *Competence* refers to the feeling of being competent and effective, able to unfold and express one's capabilities. Finally, *relatedness* refers to the desire to feel connected to others.

The first three tips offer guidance on some general aspects of digital interactions for teaching and learning. Tips 4 to 6 focus on how to support student autonomy, competence, and relatedness. Tip 5 is the most comprehensive tip, including insights from several research fields.

Tip 1: Consider the constraints of the digital format

Technology is no silver bullet that can make teaching-learning interactions meaningful. Instead, it is important to take action to minimise well-known constraints to student learning associated with the various digital formats for interaction (Martin et al., 2020). At the time of writing, a common approach is to present the different faces of digital interactions in relation to different modes of delivery of teaching on a continuum (Figure 1).

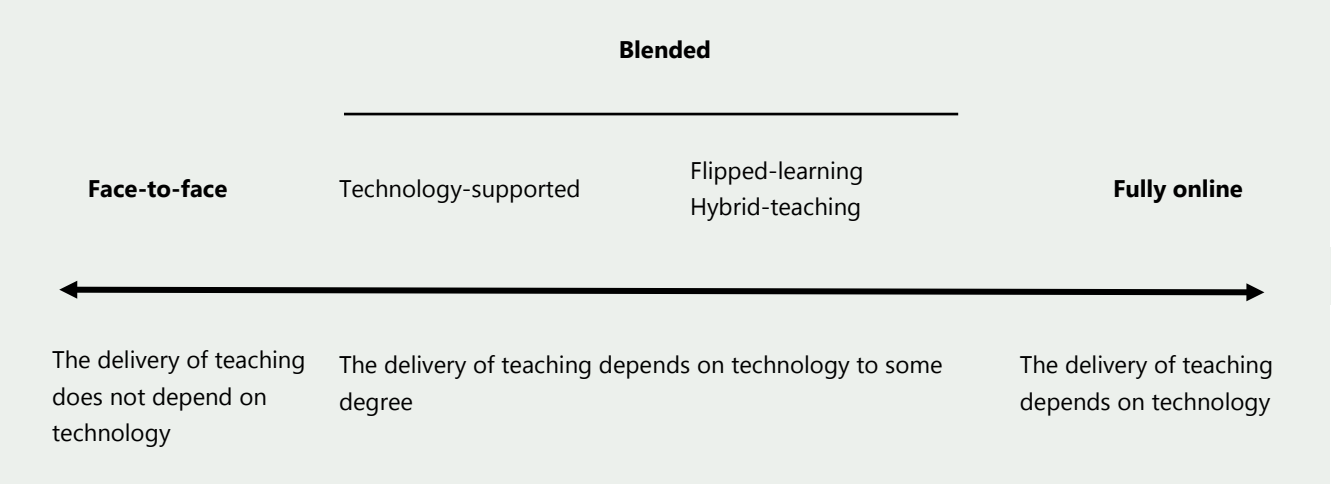

Figure 1: The continuum of technology-supported teaching, based on Garrison & Kanuka (2004) and Bates (2019)

The continuum allows you to consider the role of digital technology in your teaching and possible challenges to the success of digital interactions. The further to the left on the continuum, the more critical it becomes to consider how to link digital and less-digital interactions meaningfully on the students' part. The further to the right, the more necessary it is to address common online learning challenges, such as developing meaningful connections between students online and maintaining student motivation in online presence only.

Tip 2: Balance time and purpose

Time is an essential feature of digital interactions. Interactions can take place either *synchronously* (where people act at the same time) or *asynchronously* (where people act at different times). According to Hrastinski (2008),

digital synchronous interactions support personal participation by increasing motivation and psychological arousal. Synchronous interactions allow you to monitor the reactions of the conversational partners and 'feel more like talking' compared to asynchronous interactions. In addition, they support the exchange of social support and less complex issues such as task planning and getting acquainted. On the other hand, asynchronous interactions support cognitive participation by offering time to reflect on complex issues and process information. Recognising that synchronous and asynchronous communication support different actions and purposes implies that it is important to reflect on the timing and place of teaching-learning interactions. Which teaching-learning elements are better facilitated by digital synchronous versus asynchronous interactions?

Tip 3: Find the right technology

Educators often struggle to choose which technology to use for digital interactions. Indeed, the number of technologies for teaching and learning is enormous, and being familiar with all technologies and on top of the updates continuously launched is impossible. So what do you do?

One approach proposed by Bower (2008) connects educators' choice of technology with the goals for the teaching-learning interactions:

- Before you start to consider which learning technology you might use, you should identify the educational concern, goal or need that the interaction should support.
- Next, you describe the interaction (activity) and identify what students should be able to do. For instance, do you want your students to collaborate on writing a text, develop a digital product, or analyse an object?
- Now, you can start exploring which technology that could support the interaction.

Getting to know the technologies and their affordances may take time. You should therefore start by focusing on a few (new) technologies and slowly expand your toolbox. Also, we recommend to learn from colleagues' experiences with technology.

Placing educational concerns above technology suggests that educators are completely in charge of the situation and that technology is subsumed to educators' intentions. However, this is not the case (Fawns, 2022). Typically, educators must identify which technology to use within a selection of technologies compatible with GDPR and supported by the institution. Additionally, technology will enforce a specific view of what is effective, which has consequences for how teaching-learning interactions unfold. As a result, identifying the right technology also involves critically assessing how available technologies affect teaching-learning interactions.

Tip 4: Include student-centred approaches (autonomy)

Digital interactions in teaching and learning are often promoted as a means to support student autonomy. Student autonomy can be supported through *active or student-centred approaches* (Damşa et al., 2015; Lai et al., 2016; Lillejord et al., 2018). Generally, this comprises instructional methods that actively engage students in 'their learning process through collaboration and discussions rather than having them passively receive information from their instructors' (Lillejord et al., 2018, p. 5).

Specifically, educators might support student autonomy in digital interactions through voluntary participation, multiple attempts, low-stakes failure, non-controlling feedback, and offering students control of the technology used. In addition, offering options to personalise their learning trajectories, such as choosing between different

teaching delivery modes, supports student autonomy (Bockorny et al., 2023).

Furthermore, educators can use digital interactions to get to know the students by asking them to share their background information, knowledge, and previous experiences related to the topic. Educators can also aid student autonomy in digital interactions by adjusting the teaching to students' qualifications and allowing students to use their interests as a stepping stone for group discussions, assignments and projects.

Tip 5: Scaffold student learning (competence)

Scaffold students' cognitive development

The feeling of competence can be supported by scaffolding student learning. Educators can apply a *learning design* to plan the scaffolding of digital teaching-learning interactions. A learning design is a representation of how to support student learning throughout a particular course or lecture. In this way, it directs the attention to what the student should do to learn rather than how to cover the curriculum (Munday, 2022).

To develop a learning design, you first need to consider the alignment between the overall vision for the learning intended to occur, the format suitable for assessing student learning, and the teaching and learning activities that help students develop their understanding (Biggs, 1996). For example, try to finish this sentence: 'After this lecture/course, the students will be able to _____' or picture this: A student who took your course a year ago approaches you in the streets. The student says: 'The course/lecture that you facilitated a year ago was very valuable because _____.'

Typically, the vision will be one or more intended learning outcomes related to students' knowledge, skills and competencies, such as 'account for the fundamental ideas underpinning the field of research' or 'apply the theories to analyse case-based problems'.

Once the vision is clear, educators can identify the following:

- Which sub-competencies, -skills, and -knowledge do the students need to be successful after the course or lecture?
- How can students practise and develop the required competencies, skills and knowledge throughout the course or lecture?

The next thing is to start developing a coherent learning design with rich and scaffolded opportunities (digital and non-digital) for student development based on their level of knowledge. As an educator, it is possible to use various learning design models. One that will be known for online teaching in Higher Education is the Carpe Diem model by Salmon (2020), illustrated in Table 1.

A vision for a course or a lecture may also be value-sensitive, seeking to cultivate student agency (Stenalt & Lassesen, 2021), playful learning (Nørgård et al., 2017) or immersive learning (Bizami et al., 2022), among others. If, for instance, student agency is a priority, thoroughly consider your teaching elements from this perspective.

	Week 1	Week 2	Week X
Learning objective(s) Topic Assessment and evaluation Overall learning focus Specific learning activities (synchronous and asynchronous, digital and non-digital) Literature, supplementary material			

Table 1: Carpe Diem planning framework

Offer feedback

Students' feelings of competence should also be scaffolded by frequent and timely feedback. Both peers and educators can be providers of feedback. The critical point is that feedback should feed forward and offer suggestions on progressing. Controlling feedback and feedback, which merely gives information on the level of achievement, should be avoided (Ryan & Deci, 2017). Digital systems for feedback often allow educators to describe and structure how to give feedback, assisting students in offering peers relevant feedback.

Short feedback cycles

For the suggestions provided by peers or educators on students' work to be considered feedback, students should get the opportunity to negotiate the feedback and make changes to their work based on the feedback received (Carless & Boud, 2018). Therefore, a structure of short feedback cycles is recommended to carefully enhance the quality of students' work and competence over time. In a digital teaching environment, rapid feedback cycles can be structured through (peer) feedback systems, scaffolding students' work in a cyclic manner.

Reduce cognitive overload

While digital interactions can support student learning (Maguire et al., 2020), students might struggle to make sense of the digital learning materials they encounter. A twofold approach to help students' sense-making and reduce cognitive overload is recommended:

Include a narrative

Digital materials for student learning should be self-explanatory in circumstances where the students are studying independently and asynchronously – without immediate access to people who might otherwise help them out. Considering these constraints, it is valuable to structure materials for online learning as narratives. For example, according to Salmon (2004), it is helpful to:

(i) Include a spark to motivate the topic in focus. It could be a video clip or a personal account relating to the matter. The spark could be supplemented by describing why to engage in the task.

(ii) Summarise and wrap up discussions to mark a closure and the end of an activity.

(iii) Explain what students should do to progress to the next step.

Try not to drain the students' cognitive resources

Digital interactions often involve interactive multimodal learning environments (Moreno & Mayer, 2007) that use verbal (e.g., printed words, spoken words) and non-verbal (e.g., illustrations, photos, video, and animation) modes to represent knowledge. However, even though multimodal materials are perceived to aid learning (Moreno & Mayer, 2007) effectively, research has evidenced that 'too much' or 'the wrong balance' might overload students' cognitive capacity. For example, a recent study found that seeing others' messages on the screen during video lectures hinders the transfer of learning (Pi et al., 2022). Thus, reducing unnecessary things is recommended when using multimodal materials. To reduce cognitive processing, Mayer (2017) suggests to:

- Exclude material that is unrelated to the instructional objective.
- Highlight essential material.
- Use graphics and narration rather than graphics, narration and onscreen text.
- Place on-screen words next to the corresponding part of the graphic.
- Present corresponding narration and graphics simultaneously.

However, learning materials may still be so complex that they exceed the student's cognitive capacity. In this case, it can be effective to break the lecture/learning down into self-paced segments, familiarise the student with the key terms before receiving the online lesson, and present words in spoken form rather than having the exact words written down in the presentation (Mayer, 2017).

Structure student participation

Student learning in digital contexts may also require scaffolding of participation itself. To scaffold participation, educators may:

Establish and communicate the rules of the game

It is essential to clarify what you expect from the students in digital teaching-learning interactions and what they can expect from you. For instance, do you take questions during your lecture online in the chat or by asking the students to raise their hands and speak up or in a Q&A session? Should the students appear with the camera on and ready to engage in video-based group discussions? Rules for interactions in the digital teaching

environment can be decided in collaboration with the students to ensure they are committed to the rules. Ensure to communicate the rules for engagement before or at the beginning of the teaching session.

Make a playbook

To ensure a good flow in a technology-supported teaching session, it is beneficial to make a playbook describing how the session should unfold: when and what will something happen, who is doing what, and what is needed for it to take place successfully (see Figure 2).

Time	Activity	What should the students do	What should the educator do
8.45	Arrival	Enter the online video conference room	Admit students to the room, greet everyone informally
9.00	Presentation of structure and focus	Listening	Present the three key themes that will be in focus and the structure for the session. Ask for questions in the chat
9.10 – 9.40	Student activity based on the assignment for today 1. Presentation of student work (10 min.) 2. Student work (20 min.) 3. Follow-up (10 min.)	Groupwork in breakout rooms	1.a Present student activity 1.b Share the instructions in a link/document 1.c Make the breakout rooms. 2. Visit groups in need of help 3. Facilitate the follow-up

Figure 2: Example of a playbook describing the structure of a synchronous, fully-online session

Make it easy for students to do and difficult to avoid

Another essential part of successful digital interactions is making it easy for students to engage and difficult to avoid. Along this line of thinking, increasing the functionality of a digital system or digital materials by ensuring that students can easily access technologies and retrieve any materials online is also recommended (Georgiakakis et al., 2010; Nielsen & Loranger, 2006).

Research also suggests paying attention to student persistence. Persistence may be supported by nudges such as reminders, deadlines and explicit goal setting (Damgaard & Nielsen, 2018; Stenalt et al., 2019).

Finally, try to prevent breakdowns and react promptly in case of a breakdown:

- Scaffold students' introduction to the use of new technology or digital environments.
- Make sure that students know how and where to get help.

- Identify the reason for a breakdown. For example, is it caused by a technical error, human misunderstanding, lack of time, or a combination? If relevant, ask the student what a good solution would be. Be curious.

Tip 6: Develop relational commitment (relatedness)

When striving for meaningful interactions, developing students' feelings of being connected to others is crucial. It is recommended to:

Use icebreakers to break down social barriers

If students are to be active contributors and collaborators in digital interactions, they must feel comfortable with their interactants. Here, icebreaker activities become important as they encourage student engagement from the beginning and support the creation of connections between people. For inspiration on different types of icebreaker activities, visit Western Sydney University's Online Engagement Framework (2023) or see Redmond et al. (2018).

Encourage students' contributions and relational work through:

- The flow of speech – avoid long presentations, pause, and make room for students' comments and questions.
- One-minute breaks – include small breaks in a teaching session to allow students to consider what they understand or do not understand from your presentation. Time to reflect can fuel interaction.
- Questions – prepare and ask different questions to spur students' contributions. This could be questions asking for additional information from the students, involving other students (Would you agree?), or questions directed at specific students but allowing them to pass (cold call).
- Acknowledge student contributions – make sure that students perceive the digital interactions to be valuable, and allow sufficient time for students to complete the tasks successfully.
- Acknowledge student contribution – discuss and highlight good examples of student work, ask students in groups to highlight the best examples of student responses or papers, or let students' work feed into new activities and tasks.

Include collaborative work

Finally, relational commitment is supported by collaborative work. Deep and meaningful collaborative work requires the development of relationships (Redmond et al., 2018) and the facilitation and strategies for effective communication (Garrison & Cleveland-Innes, 2005; Thomas & Thorpe, 2019). For meaningful collaboration in digital environments, it is important to ensure that students can sense their peers, affect their peers and their work, and need their peers to complete the task successfully (Stenalt, 2021a).

Conclusion

There is no one-size-fits-all approach to digital teaching-learning interactions. Instead, it depends – in particular on what will appear meaningful to the students. The best advice is to pay attention to students' autonomy, competence, and relatedness and be sensitive to digital interactions as a multi-way process with many interactants, materials, processes affecting the shaping of students' opinions. Educators interested in evaluating

students' learning experiences can find inspiration in Ellis & Goodyear (2019). Guidance for analysing students' experiences of digital interactions is also offered in Stenalt (2021b; 2022) and Stenalt & Rossen (2022).

References

Ashwin, P. (2008). Accounting for structure and agency in 'close-up'research on teaching, learning and assessment in higher education. *International Journal of Educational Research, 47*(3), 151-158.

Bates, T. (2019). *Teaching in a Digital Age* (Second ed.). Tony Bates Associates Ltd.

Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347-364.

Bizami, N. A., Tasir, Z., & Kew, S. N. (2022). Innovative pedagogical principles and technological tools capabilities for immersive blended learning: a systematic literature review. *Education and Information Technologies* , 1-53.

Bockorny, K. M., Giannavola, T. M., Mathew, S., & Walters, H. D. (2023). Effective engagement strategies in HyFlex modality based on intrinsic motivation in students. *Active Learning in Higher Education*, *0*(0).

Carless, D. and Boud, D. (2018). The development of student feedback literacy: enabling uptake of feedback, *Assessment and Evaluation in Higher Education, 43*, 8, 1315-1325.

Damgaard, M. T., & Nielsen, H. S. (2018). *Nudging in education. Economics of Education Review*, 64, 313-342.

Damşa, C., de Lange, T., Elken, M., Esterhazy, R., Fossland, T., Frølich, N., Hovdhaugen, E., Maassen, P., Nerland, M., & Nordkvelle, Y. T. (2015). *Quality in Norwegian Higher Education: A review of research on aspects affecting student learning*. Oslo: Nordic Institute for Studies in Innovation, Research and Education (NIFU).

Ellis, R. A., & Goodyear, P. (2019). *The Education Ecology of Universities: Integrating Learning, Strategy and the Academy*. Routledge.

Fawns, T. (2022). An Entangled Pedagogy: Looking Beyond the Pedagogy—Technology Dichotomy. *Postdigital Science and Education, 4*(3), 711-728.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95-105.

Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *The American Journal of Distance Education*, 19(3), 133-148.

Georgiakakis, P., Retalis, S., & Psaromiligkos, Y. (2010). Design patterns for inspection-based usability evaluation of e-learning systems. In P. Goodyear & S. Retalis (Eds.). *Technology-Enhanced Learning*, (pp. 167-182). Brill.

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. *Educause Quarterly, 31*(4), 51-55.

Lai, M., Lam, K. M., & Lim, C. P. (2016). Design principles for the blend in blended learning: a collective case study. *Teaching in Higher Education*, 21(6), 716-729.

Lillejord, S., Børte, K., Nesje, K., & Ruud, E. (2018). Learning and teaching with technology in higher education - a systematic review. Oslo: Knowledge Centre for Education.

Maguire, D., Dale, L., & Pauli, M. (2020). *Learning and teaching reimagined: a new dawn for higher education*. JISC: Bristol, UK,

Martin, F., Polly, D., & Ritzhaupt, A. (2020). *Bichronous Online Learning: Blending Asynchronous and Synchronous Online Learning*. Educause Review.

Mayer, R. E. (2017). Using multimedia for e-learning. *Journal of Computer Assisted Learning*, 33(5), 403-423.

Moreno, R., & Mayer, R. (2007). Interactive multimodal learning environments. *Educational Psychology Review*, 19(3), 309-326.

Munday, D. (2022). Hybrid pedagogy and learning design influences in a higher education context. *Studies in Technology Enhanced Learning,* 2(2).

Nielsen, J., & Loranger, H. (2006). *Prioritising web usability.* Pearson Education.

Nørgård, R. T., Toft-Nielsen, C., & Whitton, N. (2017). Playful learning in higher education: developing a signature pedagogy. *International Journal of Play*, 6(3), 272-282.

Pi, Z., Tang, M., & Yang, J. (2022). Seeing others' messages on the screen during video lectures hinders transfer of learning. *Interactive Learning Environments*, 30(10), 1809-1822.

Redmond, P., Abawi, L., Brown, A., Henderson, R., & Heffernan, A. (2018). An online engagement framework for higher education. *Online Learning*, 22(1), 183-204.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68.

Ryan, R. & Deci, E. (2017): Self-Determination Theory. Basic Psychological Needs in Motivation, Development and Wellness. Guildford Press.

Salmon, G. (2020). *Module Carpe Diem Learning Design: Preparation & Workshop.* Retrieved Feb 24. 2023, from https://www.gillysalmon.com/uploads/5/0/1/3/50133443/carpe_diem_planning_process_workbook_webversion1june2020.pdf.

Salmon, G. (2004). *E-moderating: The key to teaching and learning online*. Psychology Press.

Stenalt, M. H. (2021a). *A constraint-based understanding of student learning in digital education*. PhD Thesis. Aarhus: Aarhus University.

Stenalt, M. H. (2021b). Researching student agency in digital education as if the social aspects matter: students' experience of participatory dimensions of online peer assessment. *Assessment & Evaluation in Higher Education*, 46(4), 644-658.

Stenalt, M. H. (2022). En metode til undersøgelse af digitale interaktioner fra de studerendes perspektiv. *Tidsskriftet Læring Og Medier* (LOM), 15(26)

Stenalt, M. H., & Lassesen, B. (2021). Does student agency benefit student learning? A systematic review of higher education research. *Assessment & Evaluation in Higher Education*, 47(5), 1-17.

Stenalt, M. H., Lassesen, B., Rossen, D. S., & Bager-Elsborg, A. (2019). Kan videregående uddannelser mindske frafald ved hjælp af læringsteknologi? Et systematisk review. *Dansk Universitetspædagogisk Tidsskrift*, 14(26), 82-102.

Stenalt, M. H., & Rossen, D. S. (2022). *Onlineundervisning: En praksisnær guide til planlægning, gennemførelse og evaluering*. Samfundslitteratur.

Thomas, G., & Thorpe, S. (2019). Enhancing the facilitation of online groups in higher education: a review of the literature on face-to-face and online group-facilitation. *Interactive Learning Environments*, 27(1), 62-71.

Western Sydney University (2023). *Online engagement framework.* Retrieved Feb. 24. 2023, from https://lf.westernsydney.edu.au/engage/theory/online-engagement-framework#toc-anchor-2.