Teaching Online Teaching Online: Seven Pedagogical Principles for Teacher Training

Mikkel Godsk
Centre for Science Education
Aarhus University
Denmark
godsk@cse.au.dk

Rikke Frøhlich Hougaard
Centre for Science Education
Aarhus University
Denmark
rff@cse.au.dk

Annika Büchert Lindberg
Centre for Science Education
Aarhus University
Denmark
abl@cse.au.dk

Abstract: The article presents the learning design of a teacher training module at Aarhus University for science teachers in digital learning design and its seven pedagogical principles. Furthermore, the article discusses the design of the module and presents the learners' experiences with the seven principles. The article concludes that it is possible to design online teacher training in online teaching with good learning outcomes and a high learner satisfaction based on the seven principles as learning design framework. Nevertheless, some circumstances and their possible influence on the learning results and experience would need a further scrutiny.

Training Teachers in Digital Learning Design at Aarhus University

Teacher training (or sometimes referred to as "teacher education", cf. Allen, 1940) at Aarhus University is organized jointly for all four faculties with three compulsory and three optional modules (of which the participants must choose one). The extent of the entire teaching training program is 5 ECTS credits (European Credit Transfer and Accumulation System, European Commission, 2009), which corresponds to a workload of approx. 150 hours and is typically completed within half a year. One of the compulsory modules is within the field of educational technology and is, at the Faculty of Science and Technology, entitled "Digital Learning Design". Until recently teacher training modules in educational technology were optional, but due to new policies (cf. Aarhus Universitet, 2011) and pedagogical trends at the university, digital learning has now been put on the agenda and thus included in the teacher training program as a compulsory module from 2012 and onwards.

The vast majority of participants in the teacher training program at Aarhus University is employed as assistant professors or postdoctoral fellows at the university. Completion of the program is a prerequisite in order to qualify for tenured positions as associate professor. However, only a minor fraction of participants from the Faculty of Science and Technology is in tenure track positions upon participation in the program, and most participants' primary obligation and interest is their subject specific research. Their prior experience with

teaching at university level varies tremendously from giving occasional guest lectures or hosting journal clubs to being the sole responsible for comprehensive courses with hundreds of students.

Module Objectives

The module Digital Learning Design was designed to specifically target the strategy of educational technology at the Faculty of Science and Technology by introducing the concept of *digital learning design* (cf. Conole et al., 2004). It is the overall objective that participants acquire insight and skills that immediately can be applied in their own teaching practice as described in the learning objectives below. During the module the participants are expected to (cf. Godsk, 2012):

- Gain insight into relevant educational technologies and pedagogical methods and theories

At the end of the module, the participants are expected to be able to:

- Evaluate the potentials of using educational technology in teaching practice
- Evaluate the potential usages of different technologies in teaching practice
- Transform traditional teaching into blended and online teaching
- Design and develop blended and online learning
- Teach with educational technology

The accomplishment of the intended learning objectives were evaluated during several learning activities throughout the module. Hence, during activities, participants were asked to reflect on the use of specific technologies in their own teaching and to develop a description of an online teaching activity. At the end of the module, all participants developed an individual learning design to be used in their own teaching. The rational behind the module was to ensure alignment between learning objectives, teaching activities, and assessment tasks, according to the theory of constructive alignment (Biggs & Tang, 2011). Designing activities so that participants build upon their current understanding of and experience with educational technology ensured a constructivist approach. During all activities participants were required or encouraged to comment on the contributions of others, and feedback on activities was provided both by peers and teachers.

The Design: 4 Weeks of Online Learning

The module objectives were crystallized into a four week online module implemented in the university LMS (Learning Management System), Dokeos 1.8.4 (2013). Each week contained 2-4 compulsory and 0-2 optional learning activities of which all were asynchronous except for a short demonstration of the video conferencing tool (in the first week), the individual supervision (in the third week), and the closing of the module with on-campus presentation of the participants own learning designs. As the module corresponded to 1 ECTS, i.e. 30 hours of work, the average daily participation was estimated to 1.5 hours on average; however, the participants, hereafter called learners could decide to pool their effort within the different weeks.

The pedagogical design was inspired by Gilly Salmon's concept of scaffolding (Salmon, 2011), i.e. moving gradually from focusing on *accessing* the system and online *socialization* to the higher (taxonomic) levels with actual learning in terms of *information exchange*, *knowledge construction*, and *development* of own teaching materials and practice. However, as the learners already had some experience with online communication and would value a highly academic approach (all learners held doctorate degrees), the first stages were designed relatively steep in order to quickly reach the high levels with academic information exchange and development. Additionally, the ideas of both individual and social learning activities as expressed by Sfard (1998), Brown et al. (1989), Lave and Wenger (1991), and Wenger (1998) were reflected in the design with both individual and social learning activities. The social learning was, for instance, reflected in the discussion forums where the learners were asked to share their thoughts on and assess certain learning technologies and pedagogical models and comment on other's contributions. The individual learning aspect was

reflected in the individual readings of relevant, published articles and the introductory and explanatory texts that combined the different activities.

Each week was structured as a sequential learning path of 3-16 steps combining the explanatory texts with the activities. Activities were embedded in the texts and clearly marked as blue boxes (see Figure 1) and direct links to the discussion forums etc. were provided. During the first week the learning activities were highly structured moving to more theoretically complex and open-ended activities in the later weeks.

The number of participants in the Digital Learning Design module will vary (range from 8 up to 20) each semester, but in this first repetition 8 participants/learners were enrolled. Although this is a small number of participants it still provides valuable feedback that we have included in this article.

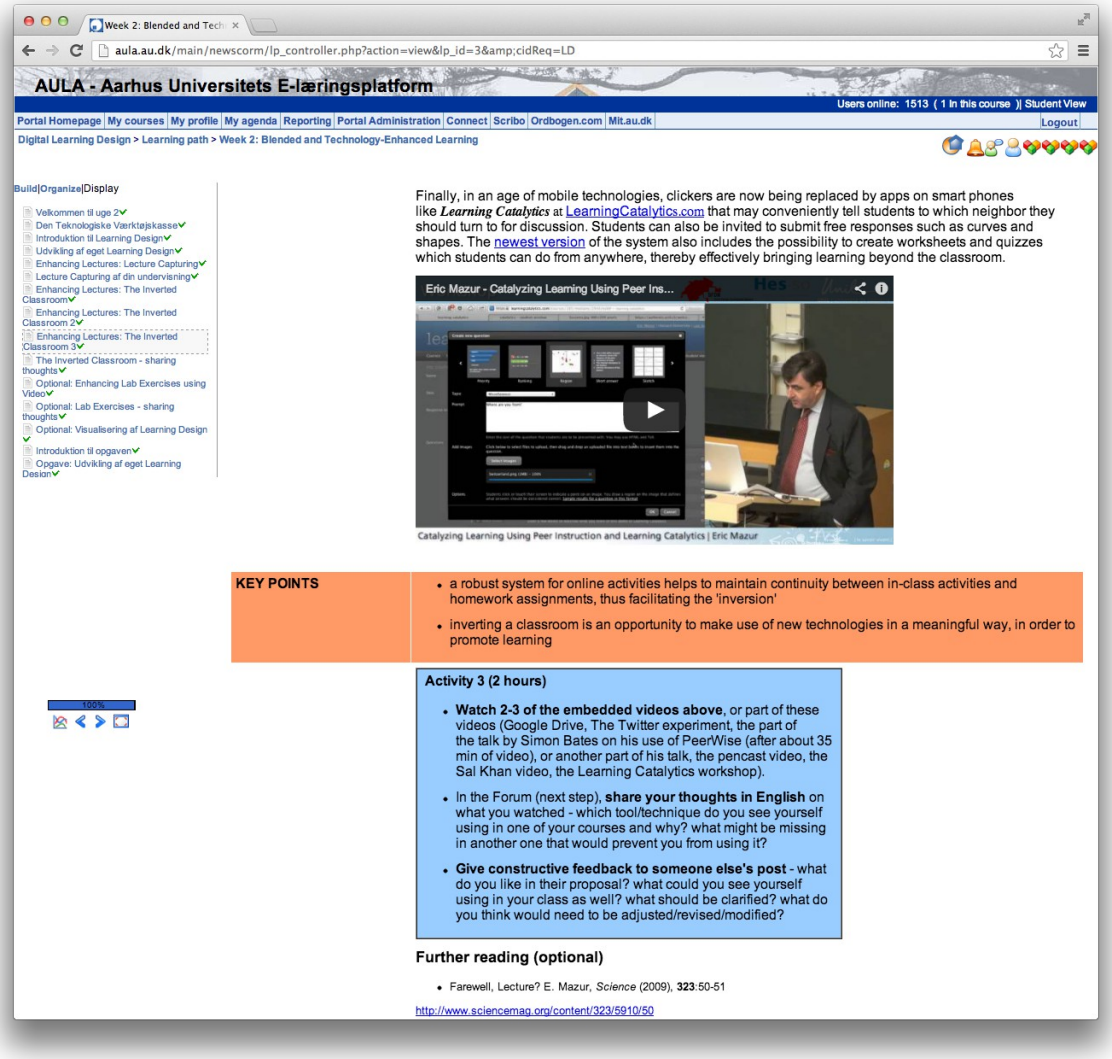

Figure 1: The learning design of the module. The screenshot shows an excerpt of Week 2, Step 9. The left menu provides an overview of the week's learning path and the content area, which is this case, contains a learning activity about "flipped classroom".

Teacher Profile

The module was facilitated by five teachers (or in this context referred to as *e-moderators*) who were all involved in both the development of the module, production of teaching materials, providing feedback to

learners, and e-moderation. Four of the e-moderators work professionally with academic development and e-learning at Aarhus University and have a background in science, and one of e-moderators is an independent e-learning consultant. All five were certified e-moderators from "All things in moderation" (2013) and each had their special responsibility in accordance with their expertise in the related subjects (e.g. lab teaching, simulations, flipped classroom, video lectures, online and distance education/e-learning in general etc.). The e-moderator with expertise in online and distance education/e-learning in general was also the module chair and ensured the red thread through the activities and the module management. Each e-moderator moderated activities during 1-2 weeks and was involved in the supervision of 2-3 learners. During supervision e-moderators and learners were matched according to the learning design being developed and/or discipline of learners.

Participant profile

None of the participants/learners enrolled in the course characterized themselves as experienced users of educational technology. Asked to mention their favorite teaching technology several participants mentioned power point, while one mentioned pen and paper for its flexibility. Several mentioned that they would like to use student response systems in their teaching.

The majority of learners did not have elaborate experience as teachers. Two learners (engineers) were new teachers with no prior teaching experience. Three learners were giving occasional seminars and lectures and taught as teaching assistants during graduate school. Only three learners had extensive teaching experience as lecturers with responsibility for entire courses (Figure 2 A).

The learners represented five (Bioscience, Engineering, Chemistry, Physics and Astronomy, and Agro-ecology) of the twelve departments at the Faculty of Science and Technology at Aarhus University. Four learners were employed as postdocs, three as assistant professors (one with research as main task, two with teaching as main task), and one as a senior researcher (research experience comparable to professorship but without tenure) (Figure 2 B). It should be noted that three learners were from departments that were only recently merged with the university (2007 and 2012, respectively). One learner was from the Department of Agro-ecology, which was recently a sector research institution with only limited teaching activities. Two learners were from the Department of Engineering, which was formerly an independent college without significant research activities. The latter two participants are trained as engineers with experience from the industry and did not hold a university degree. In their current position as assistant professors with teaching as the major task they are also enrolled as Ph.D. students.

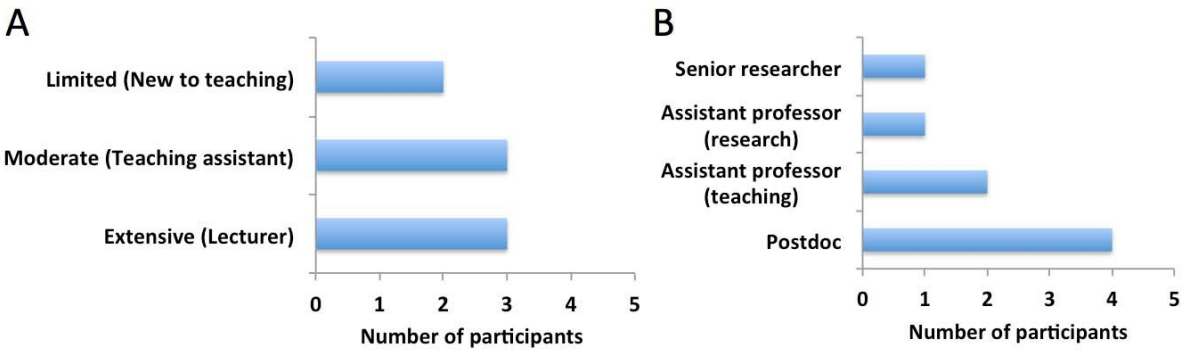

Figure 2: The participant profile. Graphical representation of A, the participants´ self-reported teaching experience and B, the career level of the participants at the time of the module.

The Seven Underlying Pedagogical Principles

The module was designed and taught according to seven underlying pedagogical principles. The principles were derived from years of first-hand teaching experience, previous experiences with similar modules,

various pedagogical theories and models, and research on educational technology. The background behind these principles, how they were implemented and their effect are elaborated in the following sections.

The outcome was assessed through four sources: A) A web-based survey addressing content, module organization and conduct as well as the learners view on their own learning outcomes, was carried out immediately after the module. The survey included 29 questions, of these 22 had positive statements that participants rated from "strongly agree" to "strongly disagree" or from "very relevant" to "not relevant". In one question participants could choose multiple options and six questions gave the possibly of writing additional comments or suggestions. B) The actual learning process was made explicit and monitored during activities and development of products where the learners were required to share thoughts or materials in the forums and these could be analyzed according to the content of posts, the design of materials, and other kinds of learner activity. The forums progressed from an initial forum where participants presented themselves over forums where they shared and debated e-learning issues to a forum where they over two weeks discussed the product (a digital learning design) they were going to develop. C) A reflections forum in Week 4 for closing reflections where the learners were asked to describe what they have found educative, useful, relevant etc. and how this would affect their teaching practice in the future. In addition the participants could respond to the reflections of others. D) Statistics provided by the LMS concerning the number of forum posts, accesses, time consumption etc.

Principle 1: Exemplary

First and foremost the module was designed as online learning in order to serve as a good example of how this kind of teaching can be carried out. There are several benefits for doing this. First, the learners get exposed to online learning and become familiar with new technologies (discussion forums, wikis, learning paths etc.). They try exemplary use of the technology and experience first-hand how the technology is supporting their own learning. Second, the learners go through the same learning process, as their own students will experience when new technologies are incorporated into future courses. This will give learners a student-centered view of barriers, strengths and weaknesses of the new technologies. Third, inspired by the concept of zone of proximal development (cf. Vygotsky, 1978) it was our philosophy that by exposing and introducing the learners to completely online learning (i.e. as an advanced form of digital teaching) they will find it relatively easy to later teach in blended learning settings.

In their final reflections about the module a learner wrote; "It was inspiring to experience how an online course is designed and how it is to be a student on such as course". A similar statement supported this: "learning path is an easy way to get started with online learning and most students will react positively to the structure and clarity it provides". In the final survey 100% of the learners strongly agreed that the learning activities were coherent, which suggests that the design of the module may serve as inspiration for their own teaching design.

Principle 2: Teaching-oriented

In order to motivate and make the learning activities as applicable and relevant to the learners as possible, the mandatory learning activities were designed to build upon the learners existing teaching experiences (cf. Godsk, 2010). To implement this principle, the majority of activities were product-oriented, meaning that the learners were asked to develop learning materials that could be applied directly in the learners current courses and as such use the module to start enhancing/transforming their existing teaching practice. Their final assignment in the module was to develop a digital learning design including concept description, learning activity, digital material(s), and describe its use in teaching practice. The design should be related to their own teaching practice and preferably have a design so that is can be directly applied.

It was our experience that all learners acquired the required skills for designing and developing learning activities and all developed useful digital materials by the end of the module. In their reflections the participants describe the technologies they will use in their current course and one of the participants is elaborating: "I will present my simulations, videos, assignments in a learning path and include a final discussion forum, where they [the students] can provide feedback on the assignment and I will be able to get an impression of the quality of their work." The simulations mentioned above were developed during the module together with

an introductory video demonstrating the use of the program, and the programming behind the simulation. The simulations were accompanied by student assignments.

All learners agreed or strongly agreed that the activities were relevant for their own teaching and they supported this with the following reflections: "the module present different approaches to online learning and puts them into a pedagogical and practical (*important*) context". A longer additional reflection pointed out: "the module on e-learning was extremely inspiring and there is no doubt that I will use what we learned. Not only the concrete initiatives, but also in the long run has the module been an eye-opener for how important this form of teaching will be in the future - there is no future without e-learning and 100% online courses that can reach the entire world. The major strength of the module is the visions it has generated."

Also when evaluating all activities in the module the most favored activity by the learners was the design of a digital learning design for their own courses. The focus when developing the digital learning design was to solve or minimize challenges identified in their own teaching. This illustrates that the learners are motivated when they are supported in solving challenges relevant to their own practice as a teacher.

Principle 3: Learner-oriented

As demonstrated in other local teacher training initiatives, a learner-oriented approach may be highly beneficial in order to ensure motivation and optimize the learning outcome (cf. Godsk, 2010). Our aim was to center the module on the learners pedagogical and technological needs and demands (as teachers) and academic expertise. In practice this meant that each learner discussed the use of technologies with regards to his/her own field and the field of science and technology in general and that the learners could build on their previous experience with educational technologies.

In addition an online module with asynchronous activities provides flexibility for the learners. They could do the activities at the most convenient time and this without loosing the possibility for collaborations with other learners.

The focus on the learner and the learner's own learning was supported by providing feedback on assignments (Hattie, 2009) and an individual supervision session of half-an-hour was included. The majority of learners agreed or strongly agreed that they received appropriate and sufficient guidance and feedback from e-moderators during the module. As described under Principle 6 the learners had access to personal help through Science Media Lab. The technical support was important and valued by the learners and could be expanded as pointed out in this reflection "I was missing a more practical demonstration of the hardware demonstrated in the module."

Principle 4: Research-based

When providing teacher training and professional development for university teachers the teaching should be research-based just as it is required for all university educations in Denmark (cf. law for universities in Denmark, Ministeriet for Forskning, Innovation og Videregående Uddannelser, 2013). In the context of the Digital Learning Design module the principle implies the inclusion of research results on the use of the different technologies, their effects on student learning, and references to relevant articles and other relevant resources (e.g. "read more"). If research results are ambiguous or poorly documented this was likewise communicated. In addition, the design of the module supported the learners in a research-based approach to teaching where challenges/problems in connection with their teaching were identified, solutions suggested and developed, and finally evaluations of student learning were discussed. This approach is largely consistent with the interconnected model for teacher's professional development (Clarke & Hollingsworth, 2002).

In the survey all participants agreed that the quality of the available resources were high. The participants pinpointed specific resources as particularly inspiring or helpful such as a video with Eric Mazur explaining the inverted classroom and an in-house produced video illustrating future possibilities with e-learning.

Principle 5: Mixing Individual and Participatory Learning

Each week consisted of an introduction, a number of learning activities with suggested further readings, and references. The learning activities were the backbone of the module and usually designed with one or more *individual* readings and/or exploration of video material, technologies etc., and a subsequent *participatory/social* task in terms of an asynchronous discussion in the forums where the learner could share his/her thoughts and findings. The main idea behind this principle was to ensure a balance between "substance" (i.e. the articles, research, materials containing the curriculum) and "working" with the theory in terms of interpreting and operationalizing the resources through discussions, sharing information, and exchanging knowledge.

The principle of mixing individual and participatory/social aspects of learning is inspired by theoreticians such as Sfard (1998), Brown et al. (1989), and Lave and Wenger (1991). In particular Sfard (1998) operates with two metaphors for learning - *acquisition* and *participation* - which point to the fact that learners can *acquire knowledge* (i.e. learn) by individual activities *and/or* by "participation in certain kinds of activities" (ibid.) - typically in some kind of a social context. The social aspect is further emphasized in Brown et al.'s understanding of learning: "learning is a process of enculturating that is supported in part through social interaction and the circulation of narrative, groups of practitioners are particularly important, for it is only within groups that social interaction and conversation can take place" (Brown et al., 1989; p. 40) and in Lave and Wenger's concepts of *legitimate peripheral participation* in *communities of practice* where learning is seen as social participation (cf. Lave & Wenger, 1991; Wenger, 1998; Conole, 2008). Undoubtedly, the online participatory activities in this module were important in order to achieve some of the module's learning objectives related to the higher taxonomic levels (cf. the previously listed module objectives), such as where the learner must evaluate, design, and teach with educational technologies (cf. Bloom's taxonomy in Krathwohl, 2002).

However, though the participatory aspect was highly significant in many of the activities, the concepts of individual and participatory learning do not fully encounter for the entire setting (as also suggested by Conole et al., 2004, and Conole, 2008). Also the aspects of *active learning* and *experience* were playing an important role. This was, for instance, conveyed in activities where the learners were asked or encouraged to try out different learning tools and technologies (e.g. CompendiumLD (2013), clickers, Adobe Connect (2013), smartpens etc.).

The vast majority of learners agreed or strongly agreed that they had plenty of opportunities to experiment with technologies during the module, and all learners responded that there were sufficient resources (articles, videos, and links) for participating in the learning activities. Although the learners were not asked about whether they had learned through social participation, various forums provide examples of precisely this based on the number of posts and responses.

Principle 6: Technical and Subject-related Support

In order to address potential frustrations and avoid that the learners would spend too much time on irrelevant technical or subject related aspects, technical and subject-related support were made easily available. Learners were encouraged to post questions of both kinds to a designated discussion forum (Questions and Answers) available directly from the module homepage or to call or email the teachers directly. Only one question was asked to the Questions and Answers forum, but a larger number of views in the forum (24) suggest that such support option is relevant. With regards to supporting the learners' development of materials and for technical issues, Science Media Lab was involved, offering a workshop demonstration of hardware and software described in the module (cf. Science Media Lab, 2013) and face-to-face assistance and technical support. Science Media Lab is a workshop staffed with students from primarily multimedia and IT related subjects providing assistance to teachers and other staff with the production of digital educational materials and usage of educational technology.

Principle 7: Progressive Learner Role (Scaffolding)

The basic idea behind this principle is that the participant should progress from being a learner to a designer of digital learning activities through active participation during the module (cf. Lave and Wenger, 2003; Salmon, 2011). The learners were required to access the LMS prior to Week 1, and already after a short socialization activity the learning activities during Week 1 guided the learners through evaluation of technological tools in relation to their own teaching practice. At this stage the learners had already reached a higher taxonomic level - *relational* - in the SOLO taxonomy (Biggs & Tang, 2011) by explaining the possible outcomes of using the technology, and comparing the use and relevance of different technologies. As an example, the learners shared their experiences and ideas in a discussion forum during Week 1 after being exposed to video and reading materials about the potential for educational technology. Several learners highlighted the potential of using lecture capturing in a blended learning environment and argued that this would liberate time for more interactive teaching and feedback during classes. Other learners elaborated on this post by suggesting the use of clickers to increase interaction and feedback.

The learners completed the module by designing their own learning design which implied identifying pedagogical challenges, developing digital materials, presenting the ideas, and reflecting on how it should be implemented in actual teaching practice. At this stage several learners reached the extended abstract level (i.e. the highest taxonomic level) in the SOLO taxonomy by inventing original learning design, reflecting on its application, and predicting the effect of their design. This was presented to the co-learners during the only face-to-face session, which was held at the end of the module. In other words, by the end of the module the participants have moved from learner to designer.

Conclusions

Our experiences, the survey, the learners' online activity, and their developed learning designs suggest that the seven listed pedagogical principles are useful as framework for designing and teaching teachers online teaching online. There is evidence that the learning outcomes of the module are realized and that the learners have reached a higher taxonomic level and scaffolding stage during the module and through their development of individual learning designs. Also the survey shows that all learners are motivated to use educational technologies and that 83% felt that they have sufficient skills to do so.

However, though the results are highly positive in most aspects, they do not rely on the seven principles alone. Circumstances such as the LMS and its utility for the module, the learners and their qualifications and attitude towards the subject, the amount and quality of the e-moderating, and the appropriateness of the learning activities for the learners' own practice may play an important role. As a consequence future research should address these variables by clarifying what role they potentially play and how the principles could be applied in those settings.

Nevertheless, it is our conviction that all seven principles are apt for designing similar settings of teaching online teaching online. If we should suggest the most important pedagogical principles, we would recommend Principle 2 (teaching-oriented) and Principle 3 (learner-oriented). These two principles highlight the relevance of the module for the learner and focus on their needs. Furthermore, we would recommend leaving more time for trying out the various technologies and in particular leave time for deploying the design in actual teaching practice, so that it would be possible for the learners to reflect on the impact.

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