



TEACHER ROLES IN A BLENDED LEARNING MATERIALS ENGINEERING MASTER PROGRAM: “IT’S NOT A NEW ROLE, IT’S A NEW WAY!”

*Christina Keller, Sofie Wass, Jönköping International Business School, Madelene Zetterlind,
Ehsan Ghassemali, Salem Seifeddine, School of Engineering, Jönköping University, Sweden*

Introduction

Engineering education is characterized by laboratories, mathematical foundations and design tools. These pillars of engineering education do not seem to be ideal for online education as the field lags behind other fields in adopting online education. Laboratories are for instance hard to implement online due to the need of direct operation of instruments. Likewise, course materials requiring use of mathematics have traditionally not been as easy to implement as topics that require only text-based instructions (Bourne et al., 2005). Real laboratory sessions have also shown to be more motivated for engineering students than virtual simulations (Stefanovic, 2013). In spite of this, there is increasing evidence of use of blended and online learning in engineering education. For example, online self-study environment to supplement the classroom instruction in engineering courses in graphical communication (Sun et al., 2014), virtual laboratories and simulation environments (Balamuraithara & Woods, 2007; Bourne et al., 2005) and online platforms for developing learning networks for global engineering (Meikleham et al. 2015).

The School of Engineering at Jönköping University, the Swedish foundry association, the research institute Swerea/SWECAST and twelve foundry industries cooperate to develop a blended learning one-year master program in product development in materials and manufacturing. As previously performed courses have been given on campus, teachers needed to take on new roles as blended learning teachers. In this paper, we present the initial results from a study that aims to investigate the perceived roles of university teachers in a blended learning materials engineering master program.

Teacher roles in online learning in higher education

Blended learning combines face-to-face instruction with computer-mediated instruction (Bonk & Graham, 2006). Means et al. (2009) defines online learning as learning that takes place partly or fully over the Internet. When online learning is combined with face-to-face instructions, it equals blended learning. The teacher role can be defined by authorities in the educational organisation, but also as teachers' individual perceptions. The role of teachers in distance education has been defined as the teachers' experiences and their reflections over these experiences, as well as different metaphors to describe the actions included in the role

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(Inglis, 2006). Certain competencies, which includes skills, knowledge, and attitudes, are needed to produce the desired outputs of the workplace. These competencies can be organized into distinguishable roles (Williams, 2003).

Even though research sometimes sees teacher functions in online learning as an extension of campus teaching (Alvarez et al., 2009), it is obvious that the role of the campus classroom teacher is different from the role of a teacher in online or blended learning (Bennett & Lockyer, 2004). Coppola et al. (2002) found that university teachers viewed themselves as being in a transition from “subject expert” to “performance coach” when introduced to an online learning situation. This change was linked to the styles of interaction with students and other teachers, changes in instructional design, course management as well as in control and assessment of the teaching and learning situation. From this, three specific university teacher roles were derived: the cognitive role, the affective role and the managerial role.

Williams (2003) defined four major dimensions of using information and communication technology (ICT) in teaching and learning; communication and interaction, instruction and learning, management and administration, and use of technology. The communication and interaction dimension included competencies such as collaboration and teamwork, writing skills, questioning skills, editing skills and negotiation skills. Instruction and learning required the competencies of knowledge of the distance learning field, skills in developing of collaborative, student-focused learning environments, adult learning theory, facilitation/discussion skills, presentation skills and evaluation skills. The management and administration dimension included, among other things, knowledge of support services, organizational skills, and planning skills. The fourth dimension of technology required basic technology knowledge, but also technology access knowledge and knowledge of multimedia.

Alvarez et al. (2009) outlined three roles based on the task that university teachers perform in online learning; designer/planning role, social role, cognitive role. The designer/planning role refers to tasks carried out in the planning, follow-up and organisation of the teaching and learning process, as well as anticipating enough actions to promote communication with students and among students themselves. The social role includes competencies required to intervene in the learning process in a positive way and to promote an encouraging atmosphere. The instructive role refers to the teacher as a cognitive content expert.

Hsieh (2010) performed a qualitative interview study of online instructors from Australia, Canada, China, United Kingdom, United States and Taiwan with the purpose of exploring universally held perspectives on online teaching from different online instructors around the world. Three emergent, shared perspectives of online teachings were found; interactive activities, evaluation criteria, and self-expectations. Interactive activities meant how students interacted with each other, with the online instructor or with online tools or systems provided in the course. In the perspective of evaluation criteria, interactivity, student engagement and assessing student competence were focused. The perspective of self-expectations meant that the online instructors regarded online assignments as not just a teaching job, but had as a

strong sense of commitment to create a better learning environment for students was evident. In a review of studies on pedagogical roles and competencies of university teachers by Munoz Carril et al. (2013) the authors found that roles were defined in several terms with different meanings and nuances, but that the basic roles were: technologist, administrator or manager, the assessor role and the pedagogical role.

Hung and Chou (2015) examined students' perceptions of instructors' roles in blended and online learning environments in a survey study of 750 Taiwanese university students. The survey instrument was validated into the five constructs of course designer and organizer, discussion facilitator, social supporter, technology facilitator and assessment designer. Students in both online and blended learning environments perceived the course designer and organizer dimension to be most important, followed by the dimensions of technology facilitator and discussion facilitator. Students in online learning held discussion facilitator to be an even more important role than blended learning students.

Table 1: Teachers' perceptions of roles in online and blended learning

Authors	Role categorization
Coppola et al. 2002	Cognitive role Affective role Managerial role
Williams, 2003	Communication and interaction Instruction and learning Management and administration Use of technology
Alvarez et al. 2009	Designer/planner role Social role Cognitive role
Hsieh, 2010	Interactive activities Evaluation criteria Self-expectations
Munoz Carril et al. 2013	Technologist Administrator or manager Assessor role Pedagogical role
Hung and Chou, 2015	Course designer and organizer Discussion facilitator Social supporter Technology facilitator Assessment designer

Methods

The purpose of the study was to investigate the perceived roles of university teachers in blended learning in the advanced level courses of Component casting, Advanced materials technology, Modelling and simulation of castings, Analysis of casting defects, Material testing and characterization and Environmental impact assessment. Semi-structured interviews were

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conducted with the six course responsible teachers. The interview transcripts were analysed by inductive content analysis (Graneheim & Lundman, 2004).

Findings

From the interviews, four main categories and ten subcategories were identified. The categories and their subcategories are presented in Table 2 and described in detail in the following text.

Table 2: Categories and subcategories of teacher roles from the interviews

Category	Subcategory
Interaction	Discussion focus instead of lecture focus Lack of immediate student response
Administration	Course development and planning Time-consuming administration Scalability
Online distribution	Record video lectures The use of OERs Managing quality assurance and examination
Trying new things	Tools Teaching approach

Interaction

The category *Interaction* included the two subcategories Issues related to interaction centred around the positive experience of having a discussion-focus instead of lecture-focus and the negative experience of lacking immediate student response. The interviewees described how they had realized the benefits of including students in discussions instead of simply informing them about different topics. One interviewee said:

"... I believe that we can stop having traditional lectures. That is the consequence of this, to find a structure where students can study when they can and want to. And then you get this other type of dialog. Maybe you should only have extra math help, so you can spend time on solving problems instead, just that and then skip the lectures totally."

One negative aspect of the new way of interaction was the lack of immediate student response. The interviewees described it as very different to record a lecture in the studio compared to giving a lecture in classroom full of students:

"Yes, it is a fairly different way to work, because normally when I lecture I can sometimes see if the students, or if those that are listening, are engaged and interested and sometimes you realise also that now I said something that they did not really follow. Sometimes you can see that they start to think "what did he say now?". Then you can clarify that "this was how I was thinking". But

you see it in another way. Now, you did not know when you were standing there talking if they would be able to understand it when they listen."

Administration

Several interviewees mentioned tasks and issues related to administration. These focused on the course development and planning, allocation of work and roles, time-consuming administration and scalability. The interviewees stressed the importance of planning the course development. This included course information to the students, scheduling of participating lecturers but also arrangements in the recording studio. Several interviewees found the new format to be rather time-consuming. This could be related to the involvement of different actors, such as guest lectures and company visits. One interviewee said:

"Well, it got harder of course to get it all together. We had quite a lot of individuals. We had people that that interviewed, we had people that gave guest lectures, we had two visits at the companies and things like that which felt like it resulted in a whole lot of more work. You spent a lot of time, prior [to the recordings], on establishing meetings to coordinate with all actors."

Scalability was also discussed by the interviewees who had reflected upon the possibility of providing the course to more students:

"And that was something that I realized that when you scale up to include more students. On campus, we have had more than double the number of students on the course. We have had 50 students instead of 20. And then this problem with examination grows. It takes a lot of time."

Online distribution

The online distribution of the course and the practicalities of recording video lectures, using OERs and ensuring the quality of examinations were discussed by the interviewees. During the recording of the lectures, the lecturers improved their presentation skills and learned basic recording skill like how to use prompters and what to wear. The project aimed to use OERs to incorporate previous knowledge and material in the courses. However, the interviewees found it difficult due to time-constraints, lack in quality and/or simply not finding any OERs in their area:

"It had the right content, but not the right presentation if you want this to be something that should be used to sell the business in the future. Then it should not be warm, hot and dirty, instead it should be clean, nice and environmental friendly..."

The online distribution also appeared to create both challenges and opportunities in regards to quality assurance and examination. One interviewee experienced problems in transforming laboratory assignments:

"What I thought about during the course, was that we are used to have laboratory assignments, and to transform them into reasonable assignments. I believe that we did not really succeed with that, let see what we can do more."

Trying new things

The interviewees also stressed that involvement in the course was a positive experience that made them consider new ways to carry out teaching. They mentioned that they had learned new things that can be incorporated in other courses, both regarding tools and teaching approaches:

"This have been totally new for me, everything from technology to thinking in a new way, so thinking a bit wider, not just stand there and lecture but also think in different ways and so. It feels as if I have learned a lot of things that you can bring into other courses also, even those that you are giving at the company and to make them a bit more exciting and a bit more interesting."

Conclusion

To describe and discuss teacher roles in blended and online learning can be valuable to clarify what is expected by teachers in transition from campus teaching to online learning. The roles found in our study are consistent with findings from previous research regarding interaction, administration and the learning and management of technological tools. However, roles involving the social support dimension were missing. Further research should include a larger number of interviews to further deepen and clarify the content of the roles and what competences are needed to fill them.

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