

Learning across boundaries during the design and implementation of a hybrid learning configuration*

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Introduction

When participants of interprofessional teams bring their different perspectives to bear into their collaboration, they are likely to experience boundaries (Akkerman and Bakker 2011a). These boundaries may either hinder or enhance collaboration. Although boundaries can be seen as barriers, they can also be 'spaces' with potential for learning.

In this study we explored cross-boundary collaboration within an interprofessional team that designed and implemented a hybrid learning configuration (HLC) at the interface between school and workplace. An HLC is defined here as 'a social practice around ill-defined authentic tasks or issues whose solution requires transboundary learning' (Cremers et al. 2016). The HLC that was studied here aimed to educate students for the 'knowledge society' (Hargreaves 2003) who are able to create knowledge collaboratively, across the boundaries of disciplines, professions and perspectives (Linden 2003; Black 2002). The HLC studied was designed and implemented by a team of educators and other professionals representing different fields of study and working contexts (e.g. Zitter and Hoeve 2012).

Theoretical background, questions and purpose

Several researchers have emphasized that boundary crossing can enable learning, however, they have not discussed explicitly how this is done (Akkerman 2011). Akkerman and Bakker (2011b) conducted a systematic review of literature on boundary crossing and provided a theoretical framework that characterizes the nature of boundaries, the learning mechanisms and associated processes that occur when crossing boundaries (table 1).

Table 1. Boundary learning processes and learning mechanisms

Learning mechanism	Characteristic Processes of boundary crossing	Description
<i>Identification</i>	Othering	Different practices distinguish their identities in the light of the perceived boundary.
	Legitimizing coexistence	Defining the complementarity of different practices.
<i>Coordination</i>	Communicative connection	Exchanging relevant information across boundaries.
	Efforts of translation	Giving and sharing meaning by using language of two different practices.
	Increasing boundary permeability	Minimizing discontinuities, making it easy to cross a boundary (lowering the threshold) by establishing connections between different practices.

Learning mechanism	Characteristic Processes of boundary crossing	Description
	Routinization	Developing procedures making crossing efficient, connecting actions in one practice to those in the other.
<i>Reflection</i>	Perspective making	Recognizing and making explicit the different perspectives of each practice.
	Perspective taking	Looking at things from the perspective of the other practice, leading to a change in perception or frame of reference.
<i>Transformation</i>	Confrontation	Making explicit significant discontinuities.
	Recognizing shared problem space	Addressing a problem that is important for both practices to be solved.
	Hybridization	Combining ingredients from different practices into something new.
	Crystallization	Materializing or applying hybrid creations in practice(s).
	Maintaining uniqueness of intersecting practices	Maintaining the integrity of the original practices alongside the hybrid creations.
	Continuous joint work at the boundary	Performing maintenance work on achieved transformations, i.e. keeping them alive.

Boundaries are often not expressed directly in interaction, but there are words and expressions, the so-called *boundary markers*, that hint implicitly to the existence of boundaries (Kerosuo 2004). The connection across boundaries can be enhanced by artefacts and language and can also be embodied by people. Artefacts or *boundary objects* can be defined as “objects that inhabit several intersecting practices and satisfy the informational requirements of each of them [...]” (Star and Griesemer 1989 p. 393). Boundary objects can be concrete documents or instruments, but they can also be more abstract concepts taking the form of a common language that can represent shared concepts, symbols, routines, ways of doing things, etc. For example, in a particular HLC, the students, lecturers and other practitioners referred to each other as ‘colleagues’ and ‘junior’ and ‘senior’ employees, respectively. The more abstract form of boundary object is also called ‘*shared repertoire*’ (Wenger 1998). When people, as opposed to objects, facilitate connections across boundaries they are essentially negotiating or ‘*brokering*’ across boundaries. They can do this by introducing elements of one practice to another. The broker is said to provide a ‘participative connection’ between different practices (Wenger 1998).

Based on this theoretical framework we aimed to gain a better understanding of boundaries and explored how this understanding could provide opportunities to enhance learning. Related research questions included:

- . What is the nature of the boundaries experienced by the members of the HLC design team?
- . Which boundary markers do they use?
- . What (potential) learning mechanisms and processes are in play?
- . What is the role of boundary objects and brokers?

Case description

The HLC design team that was studied collaboratively designed, constructed, implemented and evaluated an HLC at the interface between school and workplace in six iterations of one semester each. This HLC aimed to educate future professionals who are able to contribute to multidisciplinary

and multi-sector innovations in the field of sustainability (Antonides and Hoetink 2005). The students, who acted as 'junior professionals', carried out assignments for clients in the region. The HLC design team, the 'senior professionals', acted as their coaches and instructors.

The HLC was initiated by two Dutch educational institutions for senior secondary vocational education (in Dutch: MBO) and two universities of applied sciences (in Dutch: HBO), in collaboration with two companies. The design team consisted of representatives of these educational institutions and companies. Five lecturers from five different study programmes participated, two educational consultants/researchers, one independent educational consultant, two participants from companies, a project manager and a secretary. The team members worked part time at the HLC and spent the rest of their time at their own educational institution or their company.

Method

The research questions in this study were answered by mirroring the theoretical framework on boundaries with the verbatim reports of interviews conducted with 11 members of the team that designed the HLC. Thus the framework provided a lens through which boundaries, ways of boundary crossing, learning mechanisms and processes became visible. For three boundaries that appeared most prominent in the data, the related articulated reflections were coded according to the key elements of the theoretical framework: *Boundary markers and nature of the boundary* (origin, practices separated by it), *Learning mechanisms and processes* (table 1), and *Boundary objects and brokers*.

Results and conclusions

Three boundaries were mentioned most frequently by the design team members:

1. the boundary between business and education,
2. the boundary between the designers and the educators, and
3. the boundary between the HLC and its surroundings.

The findings suggest that boundaries, such as the business-education boundary, can be expected given certain systemic differences. However, they also emerge during collaboration, which was the case with the educator-designer boundary and the boundary around the HLC. Together with Akkerman (2011) we conclude that boundaries are revealed and experienced as discontinuities during interaction and not as systemic or observable differences per se. When there are differences on a system level, boundaries may be expected but they are not always perceived as such. And at the same time, as this study revealed, boundaries may be unintended and yet they are experienced as such.

We also found that boundaries can be highly personal, subjective constructs. This feature should be taken into account when choosing means of bridging them or utilizing their learning potential. A member check showed that participants varied in the degree to which they experienced any recognized boundaries as discontinuities, and they varied in the boundaries that they mentioned.

Boundary markers, or interactions and reflections by participants that indicated separation or cognitive dissonance, included "we are not in 'Ba'" (referring to being in the same cognitive space), "they [the designers] work in separate rooms", "we created an ivory tower", and "I don't want to go back into my cage" (referring to the work at the home institution as opposed to working with the HLC team).

Boundary 2 (designers - educators) and 3 (HLC and its surroundings) showed that emerging boundaries seem to foster new identities, goals, motives, expectations and language among participants on each side of the boundary. At the designer-educator boundary individual participants sometimes recognized these new characteristics, but they were not always made explicit or confronted, and this led, to some extent, to unfulfilled expectations on both sides of the boundary. In accordance with Akkerman (2011), we conclude that the nature of a boundary would be clarified by making the sociocultural practices on both sides of the boundaries explicit. This would provide the opportunity to discuss, negotiate and possibly enhance boundary learning processes.

Regarding boundary 3, design team members as well as practitioners outside the HLC had difficulty to identify the HLC as a new practice that was different from other forms of education. Notably, collaboration with other institutions did not get started. Therefore we conclude that the boundary learning mechanisms of identification and reflection seem to be a prerequisite for successful coordination or transformation. This is in line with Akkerman and Bakker's (2011b) hypothesis about how the mechanisms relate to one another. It follows that the learning potential of boundaries might be

better utilized if explicit attention is first paid to identification and reflection before moving into coordination and transformation. The fact that each mechanism and almost every learning process was represented in the data suggests that there is no hierarchy between mechanisms in the sense that one is 'better' than the other or that transformation should always be strived for. Each mechanism seems to have its own merit.

It also seemed advisable to get to know the participants' learning preferences and to make use of learning mechanisms and associated processes accordingly. Some of the educators preferred to get 'ready to use' tools or procedures from the designers (coordination) whereas others liked to co-create and experiment together (transformation). Some educators were ready for something new in every iteration and others needed or preferred to have at least two iterations in order to really grasp a concept or procedure. This difference may be related to the time spent with the HLC-team, which was different for each participant.

Boundary objects seemed to play an important role within the boundary learning mechanisms of coordination and transformation. Boundary objects can be more effective when they are accompanied by information (explanations by people, e.g. inception, history, surrounding negotiations). This information can be very helpful in rendering boundary objects intelligible to other parties or for future use (Star and Griesemer 1989). This was illustrated by educators who indicated that they preferred to know the ideas behind new concepts that were introduced by the designers (boundary 2). Moreover, brokers can play an important role in enhancing understanding of boundary objects (Wenger 1989). The HLC-team seemed to be aware of this in relation to boundary 3, though not in an explicit way. They wished to collaborate with other practices in order to transfer tools or concepts of the HLC to different contexts, but they did not want others to 'pick and choose' elements from it in the absence of explanation or advice from an HLC-team member.

Successful brokering was illustrated by an educator (boundary 2) who translated abstract educational concepts into concrete guidelines for students and coaches. The other participants explicitly acknowledged her as a broker (indeed, she called herself a 'translator'), which seemed to enhance her functioning as such. A process of brokering that occurred around all three boundaries was the transfer of what was learned or developed at the HLC to another context, often the participants' own working context. Brokers not only appeared to bridge boundaries using objects, theoretical concepts, or jointly created constructs or language, but also with intangible assets such as behaviour, attitude or mind-set. This was illustrated in boundary 3, when colleagues at the home institution saw a participant of the HLC work in a different way, and when participants said that their mind-set changed and they saw things differently because of participating in the HLC.

Implications

We found that if boundaries are detected through 'boundary markers' in the participants' language, and if the practices or perspectives associated with the boundaries are made explicit, this allows for further investigation and understanding of these boundaries. The results suggest that the intentional introduction and utilization of the concept of boundaries provides opportunities to enhance cross-boundary learning. As transboundary collaboration becomes increasingly important in our knowledge society, it is vital that we learn more about boundaries and possible strategies for enhancing cross-boundary learning.

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