The Chance for Sociability. How Participation and Interaction Structures of Adolescents with Brain Injury on an Institutional Corridor Inform Smart Learning Ecosystems.

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Abstract. The paper raises the question of how residents of a rehabilitation and education center in Denmark use the center's main corridor to engage in social or focused activities. We aim to inform the design of smart learning ecosystems to support adolescents with brain injury in social and informal learning. We argue that research on smart learning environments focuses too narrowly on classroom interaction and neglects the socially situated and interactional side of learning. Thus, we investigate (1) how a corridor can be understood as a place for informal and social learning; (2) how young people with brain injury who have problems engaging in social interaction participate in interactions along this corridor; (3) how these insights inform research on smart learning ecosystems, which aims for supporting informal and social learning. We conclude that this approach transforms traditional learning approaches as well as the actual layout and design for the built environment.

Keywords: place for learning, smart learning ecosystem, social learning, participation, brain injury

1 Introduction

This paper raises the question of how residents of a rehabilitation and education center in Denmark use the center's main corridor to seek or engage in social or focused activities. The aim of the paper is to inform the design of a smart learning ecosystem (SLEco) to support adolescents with brain injury in social and informal learning. Our interest in corridors as places for social learning and interaction derives from an ongoing interdisciplinary cooperation [1] between a Danish education and rehabilitation center for adolescents (16-20 years) living with acquired and congenital brain injury (often in combination with cerebral palsy (CP)). During meetings with leadership and staff the main corridor was identified as a central place where the adolescents often 'hang out' during pauses in their daily schedule. During these breaks, or periods of so-called 'alone-time', the adolescents are on their own because the staff members are occupied with other tasks.

Young people with brain injury and/or CP are reported to have difficulties engaging in leisure time activities by themselves, and they also have difficulties initiating and engaging in interactions with others, which often leads to passivity and loneliness [2-5]. Our collaboration partner formulated the wish for technical solutions on the corridor in which learning is seen as part of everyday interactions throughout

the institution and in which different types of technologies invite not only single users but also groups to engage in different kinds of learning. This description matches the definition of a SLEco, which changes the perspective in terms of where education and learning take place and in which virtual and physical environments are linked to create rooms for all kinds of learning [6,7]. Based on these considerations we started an ethnographic and human-centered development process for considering the center as a SLEco, starting with the corridor. The aim of this process was to support informal and social learning for young people on the corridor.
Social learning, which refers to the ability to learn by observation of, and, more importantly, through interactions with, others [8,9], requires the ability to participate in interactions. This paper takes a step back from this concept. Instead of developing a SLEco (which we describe in [1]), we address the question of how young people with difficulties engaging in social interaction engage in interaction. What central needs for interaction need to be taken into account to assure their participation in social learning and how can this be supported by a SLEco? Furthermore, the use of a SLEco is always bound to a certain location, which poses the question of how this space and its interactional patterns matter for (informal and social) learning in a SLE. How is the corridor a good place for social and informal learning, and how can a SLE support this processes? Thus, we shift the focus from technology to the local and socially situated interaction and participation patterns of the institutional space that should be transformed to a SLEco, a perspective we find missing in the discussion of research on smart learning environments and ecosystems.

In the next section, we place our study in the field of SLE and SLEco and discuss how interactive technologies can support learning in young people with brain injury. Next, we present existing research on corridor interactions and briefly introduce the discussion of space and place in disability studies before introducing our micro-sociological perspective on the corridor as a place for social encounters. This is followed by a brief description of our case study. We then describe the corridor of our study and the six different practices of how the adolescents with brain injury seek social contact and focused interaction on the corridor. We reflect on the different participation roles the adolescents take in these practices and end the paper with a discussion of how these insights inform research on SLEco.

2 Related Work

2.1 Smart Learning Environments and Smart Learning Ecosystems

The term ‘smart learning environments’ (SLE) describes physical and/or virtual environments where different types of smart technologies support a learner in reaching a certain learning goal. There is no clear and unified definition of smart learning. Different frameworks for SLE are proposed with the aim of defining the ‘smartness’ of the environment and what the SLE adds to traditional learning environments or how it improves different kinds of learning (see for example [10-13]). However, most studies on SLE are concerned with learning in a school or university classroom, which neglects learning as part of everyday activities [1]. Furthermore, learning is mostly approached as a cognitive process with a perspective on the learner, e.g. with the aim of providing self-learning and /or self-motivated and personalized services to the learner [13]. Thus, it misses the socially situated context in which learning often takes place. ‘Smartness’ is seen as an emergent product from

the digital tool or environment that adapts and learns in order to improve learning for the "inhabitants" [14] As Dron points out [14], this model suffers "from the flaw that the presence of smartness within an environment does not necessarily or even normally lead to smartness of that environment." He argues further that most studies focus on learning as the achievement of specified learning goals, neglecting the complex conversational process that leads to learning beside the planned goals. Therefore, this study focuses on the social processes that shape social learning in informal settings (like the corridor) and open up to informal and social learning. The study contributes to research on SLEcos that change perspective in terms of where education and learning take place and in which virtual and physical environments are linked to create rooms for all kinds of learning [6,7]. Many of these studies emphasize the necessity of including citizens and important stakeholders in the transformation process to investigate how traditional learning institutions (e.g. libraries, museums, rehabilitation, and education centers) can change to become a SLEco to support social learning and collaborative exploration [15-19, 1]

2.2 How Interactive Technologies Support Young People with Brain Injury

The invention of interactive technologies to support the learning of children and young people with brain injury and/or CP was welcomed with high hopes. Different studies on the development of single systems and prototypes report the positive effects of these technologies. Several studies focus on learning of motor skills in children with CP using virtual realities and robots [20-23]. Only a few, quite varied, studies focus on educative learning and leisure time activities of adolescents with brain injury or CP. Weiss, Bialik and Kizony [24] developed a VR to support independent leisure activities for young adults with CP, while Christiensen, Rodil and Rehm [17] promote a SLEco for cognitively impaired adolescents to engage in social learning and thus broaden the view to an institutional setting. Several studies try to take into account barriers that prevent the later usage of a technology, such as cost or the amount of time required to learn how to use the new technology. Da Silva et al. [25] engage in the development of low cost assistive technologies to support educational activities for adolescents with CP. Chang et al. [26] gamify an existing training app to motivate young adults to engage in the exercise, and [27] test the possibility of using mobile phones to engage young people with CP in virtual rehabilitation games. Despite the promising results of these studies, literature reviews on the "potential" of assistive and interactive technologies in supporting learning and rehabilitation in children and young people with disabilities point out that there is little evidence due to the lack of rigorous evaluations and long-term studies [28-30].

Furthermore, Söderström (2016) points out that despite the hopes and possibilities of assistive technologies in increasing the inclusion and participation of disabled pupils in class room interaction and learning, many studies show that those technologies are often not used as intended, are used in different ways, or are not used at all. This can be due to technical problems, but more often it is based on the human barriers,, e.g. accessibility, teacher's lack of competence, insecurity, or lack of time in getting to know the technology. This is also supported by Nam's and Park's [31] quantitative investigation that shows that a smart environment increases the already existing information divide experienced by people with disabilities. Accessibility is named the most important reason, which, in turn, has significant effects on skill and all aspects of competence. Similarly, Schreiber-Bach [32] points out the importance of designing rooms for learning that are accessible for people with special physical and cognitive needs. She argues that access to learning is not only a pedagogical issue, but in light of the UN Convention on the Rights of Persons with Disabilities, a

negotiation of citizenship and politics. In addition, Söderström concludes that the use of an assistive technology in a classroom "requires a purposeful planning and organization, in terms of both universal design of the school environments and individual adaption to the individual disabled pupil" [33:103]. These studies support our argument that we need a more holistic understanding of learning as an interactive activity in a larger socio-material environment, which exceeds both the classroom as well as the idea of an isolated user-device 'interaction'. In this paper we argue the importance of considering the spatial and participation structures of the concrete location in which the SLEco should be implemented.

2.3 Corridor Interaction

In social geography, the terms space and place are traditionally differentiated. While space is understood as a geometric conception, a place is a node in space where people make the world meaningful [34,35]. The term place is often based on a phenomenological understanding that emphasizes the impact that being somewhere has on the constitution of social but also economic and political processes [36,37]. Harrison and Dourish [38:69] formulate, '[w]e are *located* in "space", but we *act* in "place."' They exemplify this with the distinction between a 'house' and a 'home'. The house as a physical space keeps out the wind and the rain, while the home is the place we live in. Similar to the equation of home and house, our question is how the corridor as space becomes a meaningful place for the people using it and how this knowledge can inform a SLEco.

The corridor as an architectural element has a long-standing history from its early beginnings in Spanish and Italian contexts in the sixteenth century to the development of 'corridic buildings' and a 'corridor revolution' in the middle of the seventeenth [39]. As an 'instrument of modernity', the corridor was related to, for example, aspects of speed (in regard to delivering messages) and/or the construction of power and privacy (instead of going from one room to the other, the corridor allows one to pass by rooms in a building) [39:768]. After World War II the corridor came more and more under criticism in favor of concepts of 'openness' (a concept that is contested as well, see [40]. However, corridors are still central parts of many institutional buildings and several studies have revealed the importance of corridor interactions in these settings. Dickar [41] describes in her ethnographic study how the corridor in a racially segregated urban high school matters for the pupils. She identifies the school corridor as a 'thirdspace' [41:80] between the students' school-oriented and street-oriented identities. Not only is it a place for the students' identity construction but also for resistance to the power relations at the school. Hurdley [40] defends the corridor against the mentioned architectural desires for 'openness' and describes in her ethnographic study the spatial/material configurations of a university corridor to understand how existing architectural structures matter. She points out how corridors constructed as 'circulation space [...] simultaneously connect and disconnect other spaces and the people in them, making both boundaries against and openings to the outside and outsiders' [40: 46].

Next to corridors in educational settings, a considerable amount of literature has been published on communication processes in hospital corridors. Carthey [42] points out the importance of hospital corridors for multidisciplinary clinical work. Long, Iedema, and Bonne Lee [43:185] show that hospitals facilitate 'dynamic and *heterogeneous* communication in multidisciplinary teams.' As a 'neutral zone -- not "owned" by any particular professional discipline' [44:57], hospital corridors are reported to break traditional barriers of hierarchy and specialization. They are described as sites for instruction and knowledge transfer as well as places where

information is passed and decisions are made [45,46]. Lu et al. [47] shift the perspective from the professional practices to the question of how residents living in an institutional setting use the corridor. They describe the practice of 'corridor walking' [47:464] undertaken by elderly people in a residence home. In interviews, the elderly describe the corridor as a safe and convenient place to walk that is free from weather conditions and reflect on how the corridor's design characteristics (e.g. width and length of the corridor, aesthetic features) become barriers or facilitators to the activity. The authors identify three types of corridor walking [47:472]: 1. 'Walking to destinations', for example to reach the dining room or a place to play Bingo. 2. 'Walking for exercise', for example, walking around the hall several times or going from floor to floor with the aim of engaging in physical activity. 3. 'Walking for interaction', or aiming to meet people and see what is going on in the residence home. Corridors are thus described as important spaces for institutional interaction as they enable circulation and collaboration, more egalitarian social relations, and identity constructions. As such, they seem a promising place to support social and informal learning.

2.4. Space and Place and Dis/Ability

We were unable to find studies on how corridors matter for people with disabilities. Within disability studies space and/or place are mostly discussed in connection with how people with disabilities become disabled and are excluded, marginalized and oppressed due to the physical design of places (especially urban spaces and build environments) [48-53]. Disability is spatially as well as socially constructed and influenced by political and economic ideologies. Kitchin [52:343] identifies a 'disablist organization' of current spaces of mainstream society. Examples for this organization are steps without ramps that exclude people with disabilities [50], the segregation of people with disabilities to certain locations (e.g. schools or centers often outside or at the margins of the urban environment), or the traffic flow of modern cities that favors fast moving walkers, e.g. visible in the short length of green traffic lights [48]. The spatial and temporal organization of cities favors 'well-functioning' and 'productive' people who, at the same time, are constructed as the norm. Power relations and social relations are reproduced but also internalized, and people develop a feeling of being welcome or not, being 'in or out of place' [35].

In the field of architecture and everyday life design, Boys argues that disability is treated as an ephemeral part of design processes [54]. Despite attempts such as the concepts of 'universal design' [55] disability is often reduced by design professionals to 'medical and stereotypical notions that fail to capture the diversity and complexity of disabled peoples life' [56:486]. Not that they are not thought of, but disabled people become 'included as excludable' [53, see also 57] This raises the need to include people with disabilities in the design process (see e.g. [58]). While the former studies focus on the spatial construction of participation and ability, several authors within ethnomethodology, ethnography, and conversation analysis pointed out the interactional management of participation of people with brain injury or multiple disabilities [59-63]. Instead of describing communication impairments as a medical dysfunction inside the individual, these approaches focus on the interactional competencies of the people with communication disorders and the co-production of meaning and participation in social situations with others. This shaped our background to focus on the young people’s capacities to engage in social interaction on the corridor, which was a starting point for the co-creation process for a SLEco.

2.3 Social Encounters in the Corridor -- a Micro-Sociological Perspective

Our focus is on the interaction and participation structures in the corridor and how the meaning of the corridor is interwoven both with and in social action [64-66]. Space is thus 'not a worldly abstraction then, but *embodied* in, and integral to, the accomplishment of the activities that we do' [64:26]. A person's activity is always located somewhere and thus 'carried out in a specific relation to a specific environment' [67:237]. This micro-sociological perspective on the people's interactions in the corridors draws attention to the interpretative processes through which people coordinate their activities and render their actions intelligible to each other [68]. The construction of meaning and social order is understood as a situated, public, and ongoing accomplishment [69]. whereby the researcher's interest is directed to the participant's perspectives on what they render relevant and meaningful in their inter/actions.

The corridor is thus a space that becomes meaningful in inter/action and our interest is in understanding how the adolescents participate in activities and interactions in the corridor. At the moment two persons in the corridor come into each other's 'response presence' they enter what Goffman [70] calls a 'social situation', in which the participants, when aware of each other, start to interpret and coordinate their actions alongside each other (if only for withdrawal or to avoid collisions). A corridor affords several simultaneous interactions and activities, and people in the corridor can align to these activities with different degrees of involvement. They can engage in 'focused' encounters, in which the participants share a jointly sustained focus or attention, such as conversations, dancing, or work-cooperation, or in 'unfocused encounters', in which no joint focus is established and each participant follows his or her own line of concerns, such as the coordination of activities on a pedestrian street [71,72]. Within these encounters, the participants can take different participation roles [73,74]. Goffman [73] and Levinson [74] which describe the relation between the participants of an interaction, their alignment to what is said or done, and their understanding of their self. People moving along could mingle in an existing interaction, leave a group engaged in small talk, or just pass with or without greeting. Thereby they can shift their participation status; they can become 'ratified' or 'unratified participants', 'addressed' or 'unaddressed hearers', 'eavesdroppers' or 'bystanders' [73:131-132]. This builds the analytical framework of our observations.

3 Case, Data, Methods

The data derive from an ongoing interdisciplinary research project between human-computer interaction, participatory design, and sociology scholars with an interest in developing technologies and with both a foundation in the situated practices of the institutional setting under study and the participants' perspectives on these practices [1] The present study is based on a collaboration with a Danish education and rehabilitation center for adolescents between the ages of 16 and 20 with moderate to serious brain injuries. The center offers both a rehabilitation program for adolescents with acquired brain injury and a three to four year education program for both adolescents with acquired brain injury and adolescents with congenital brain injury,[1] many of them with CP. The educational program is adjusted to the individual needs of each resident. The support is directed to improve the adolescents' cognitive, physical,

[1] The term congenital brain injury bundles various 'disorders' bound to damage to the brain before, during, or briefly after birth [85].

and social abilities, to make them acquainted with their own limits, and resources, and thus to help them in their development towards an – insofar as is possible – independent adult life. The adolescents are offered a private apartment and are supported by an interdisciplinary team of occupational- and physiotherapists, a pedagogue, and a social and health care worker.

Our observations focused on the main corridor of the center that is used mainly by the young people attending the educational program. The group of adolescents is very broad and heterogeneous in terms of their cognitive, physical, and social abilities to participate in everyday life and interaction. All but one of the adolescents we observed used a wheelchair; some of them needed assistance steering it. While we could engage in verbal conversation with some of them, others communicated using sounds, gestures, communication books, or technologies steered with their hands or eyes.

The present paper focuses on the results of ethnographic observations we undertook in 2016. As is common for design processes, we engaged in a so-called 'quick and dirty' [75,76] observation process that gave us insights into the physical affordances and social activities in the corridor. Overall, we have 10 days of data collection, including ethnographic observations, workshop activities, and a semi-structured interview with the leadership. We were not allowed to use video recordings or photographs of the people in the corridor. During the ethnographic observation, we 'hung out' in the corridor, observed the activities that took place there, and engaged in conversations with by-passers. Our observations were transformed afterwards into field notes [77]. We thus immersed ourselves in the field for first hand experiences of the social lives of the people under study [78] but limited the observation temporally and with a clear focus in the corridor activities. Our observations were supplemented by insights from four participatory workshops with care personnel and citizens. The first workshop was a reflective workshop during which we discussed the activities we observed in the corridor and their relevance for employees and citizens. In the other workshops, we developed possible designs for an interactive technology in the corridor, which also elicited insights in the corridor activities and the adolescents' and staff members' wishes and abilities for social interaction. (More information on the design process can be found in [1]. We started the analysis with an open and inductive coding process, inspired by grounded theory [79], to get an overview of the activities and persons on the corridor. The development of the participation structures on the corridor were inspired by the work of Goffman.

4 Findings

The corridor under focus is long and white (2,8 meter wide and 54 meter long, Fig. 1 and 2). It can be entered from the main entrance of the center through an automatic sliding door, and it ends in a common room for joint activities; for example, a joint lunch. Several doors lead to offices, teaching and therapy rooms, depots and a toilet for staff or visitors. Four smaller corridors lead off of the corridor to the residents' private apartments. As the main corridor of the building, it connects the outside world, offices, private apartments, and common room, etc. At the same time closed doors mark boundaries of activities, people, and objects. The smaller corridors are not connected with each other, but each of them ends in a common kitchen. A staff member described the corridor using the metaphor of a 'spine' from which the 'ribs' (the smaller corridors) depart.

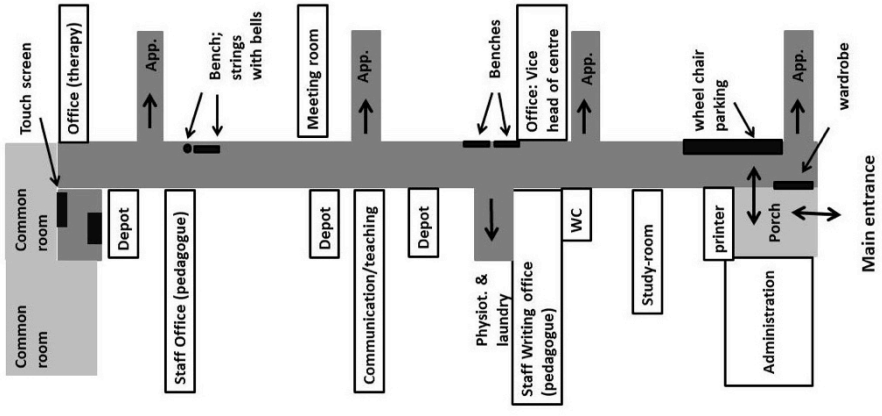

Fig. 1. Map of the corridor. The white boxes indicate doors to certain rooms.

Fig. 2. A long white corridor.

Fig. 3. Strings with beads and a bench

Fig. 4. Touchscreen at the end of the corridor.

The corridor is simply designed, painted white and with skylights and lamps illuminating the corridor, which enable a good view of what is going on there. The corridor allows for transition but also temporary limited stationary activity, such as waiting. Small wooden boards over the skirting protect the walls from damage and railings provide support if needed. Different items establish an institutional context, such as information boards, paintings, and photographs of past joint events as well as objects for entertainment, e.g. strings with bells hanging from the ceiling (Fig. 3) and a mobile interactive touchscreen (Fig. 4). During the day, different group of people use the corridor. We observed visitors entering the corridor on their way to a certain destination or waiting in front of an office. Staff members on their daily routines entered and left offices, engaged in brief corridor conversations or accompanied residents on their way somewhere. Cleaning personnel moved systematically through the corridor and residents with or without company moved along the aisle on their way to, for example, physiotherapy, the laundry, or teaching. That does not mean that the corridor was crowded or buzzing with people. The atmosphere in the corridor was rather calm, and it conveyed the feeling that others were around. During the day, even when nobody was in the corridor, voices or music could be heard behind the doors. At certain times during the day, we observed some 'peaks' in which many people were in the corridor, as, for example, when the personnel arrived and left for the day and night shifts. Another 'peak' was before common activities, for example, when the personnel and adolescents came to the corridor and moved alone or in smaller groups to the common room for a joint lunch.

These observations confirmed the main corridor's central position in connecting spaces and everyday affairs of the center, which resembles Hurdley's (2010: 46) expression of a 'circulation space' that connects and disconnects other spaces and the people in them and stresses its importance in the transformation of the center to a SLEco. Despite the different objects on the corridor, it was mainly the interactive objects and technologies that drew the young people's attention, which again supports the results of other studies that adolescents with brain injury are interested in the use of those technologies (see literature in section 2.2).

4.1 Focused Activities in the Corridor During 'Alone-Time'

Besides adolescents who used the corridor for transportation from one place to another (e.g. going to the laundry, the common room, outside, or physiotherapy), we regularly observed adolescents who engaged in focused and/or technology-bound activities in the corridor. For example, some of the adolescents regularly came to the corridor with their iPads to listen to music or audio plays, or to use the mobile touchscreen placed in the corridor to watch music videos and/or dance on the floor. One girl regularly came to the corridor to run her fingers, hands, and arms through some strings with bells that were attached to the ceiling, seemingly enjoying the tacit experience and sounds (Fig. 3 and 5).

In their activities in the corridor, the residents organized their bodily co-presence in different mobile or stationary 'participation units' of so-called 'singles' or 'withs' [80] around different interaction foci or objects. Our observations show that the adolescents used the corridor to engage in focused activities with interactive objects or technologies that stimulated their senses (audio or touch). They rarely stopped to look at pictures or photographs in the corridor. They used these technologies mainly alone; only a few times could we see the adolescents engaging in joint activities with another. Once, for example, two adolescents were dancing on the floor beside each other next to the touchscreen, and another time one resident observed another who was using the touchscreen (Fig. 8).

Our observations thus show that (some of) the adolescents at the center are able to engage in focused activities with interactive technologies, a necessary competence if we want to design interactive technologies to support the adolescents' wish for social interaction and activity. Furthermore, we can see that they frequent the corridor for these activities, which marks the corridor as an opportune place for these technologies. Furthermore, we could identify certain time-patterns, as these activities are mostly done during alone time that also needs to be considered for the design of the interactive technology. Both the ability and willingness to engage in focused and technology-bound activities in the corridor during alone time also mark the transferability of our results to other institutions that face similar patterns in resident behaviors [2-5]. However, our aim is not to just confirm former studies; our question is much more whether we need to redefine involvement and participation according to the young adults' terms. Can we find different practices by which the adolescents show their wish for social contact and joint or focused activities to inform the design of SLE that can take into account the way they express interest and involvement?

4.2 Practices of Seeking out Social Contact and Activity

We have demonstrated that the adolescents orient towards the corridor not only as a place for focused activities but also as a place for social encounters. In the following section, we identify six *seeking practices* by which the adolescents' show their orientation to the corridor as a place for social encounters.

Being Available

Fig. 5. Playing with strings and bells

Fig. 6. Entering the door.

Fig. 7. Reaching out a hand to a passing caregiver.

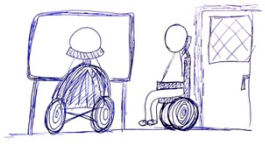

Fig. 8. Joint activities at the touchscreen

The adolescents who frequented the corridor to engage in solitary focused activities showed, at the same time, a desire to make contact with others. While they could have chosen remote places (for example, their own rooms) for those activities, they chose instead to place themselves in the corridor. Furthermore, when others passed the adolescents, the adolescents stopped their activities (e.g. listening to music, dancing, or playing with the bell-string) and directed their attention to the passersby. They smiled or made sounds of greeting. They also reached out often to the passersby (Fig. 7), and/or pointed at something in their communication book or on their iPad. These activities could be understood as 'maintenance rituals' [81:76] by which the participants demonstrated their acknowledgment and sympathy for the other and signaled their availability for a possible interaction. Especially when the adolescents reached out to passing staff members, the personnel treated this as an initiative to engage in further interaction. The personnel either took the offered hand and engaged in brief small talk, asked if they could help, or ignored the gesture and focused on their present task or duty, thus demonstrating that they were not available for further interaction.

Mingling

We frequently observed that adolescents approached groups of employees already engaged in interaction in the corridor and became bystanders or participants in the ongoing interaction. These groups often opened up to the approaching adolescents by turning to them, making space so they could enter the spatial distinguished group formation, and/or directing questions to them, such as 'are you looking for someone?' or ‘would you like to join?' Some groups also just accepted the new bystander and resumed the ongoing interaction. For example, an employee addressed an adolescent who had just entered an ongoing discussion with the words ‘you could just sneak in'

('Der kunne du lige snige dig ind'), and then resumed the discussion with her colleague. We call this practice *mingling,* as the adolescents showed a clear interest in becoming a 'with' in social encounters of one or more participants (mostly employees). Sometimes this practice transformed into a kind of zig-zag movement across the corridor, in which the adolescents moved from one available employee or group to the other each time the attended encounter dissolved.

Monitoring

In contrast to this mobile unit that builds a participation unit of a 'with', we also observed adolescents that were *monitoring* the activities in the corridor from a distant and stationary position. One boy in a wheelchair came in the corridor regularly during the day and positioned himself at its end (near the entrance) so he could observe the whole corridor. He stayed for about 20-30 minutes. In addition, the staff reported that some of the adolescents who could not move independently often asked to be placed in the corridor during alone time. The employees described these adolescents as 'spectators' (in Danish, 'tilskuer') of the events in the corridor and compared the corridor to a 'pedestrian street' or 'market place' in which people observe what happens. Both our observation and the employees' description thus emphasize that the adolescents oriented to the corridor as a place for social encounters.

Scanning

The adolescents' wish for social contact and activity is not always met by the presence of relevant other in the corridor. Regularly and repeatedly during the day we observed adolescents coming out of the minor corridors, peering up and down the main corridor and retreating to the minor corridor if nobody but the observing researcher were in the corridor, just to reappear a bit later repeating the procedure. This *scanning* of the corridor could happen several times an hour. The practice orients to the corridor as a place to look for others, which was also expressed by one of the residents who pointed out to us that he often goes into the corridor during the day 'to see what is going on'. The staff who defined the corridor as a place where you have the ‘chance to meet others’ also reflect this behavior.

Summoning

We also observed adolescents who came into the corridor and began to knock on doors looking for a staff member. We call this practice *summoning* [82], as it is directed to a person behind the door who is expected to answer. This activity could also develop into a kind of 'quest' for employees. We observed, for example, an adolescent who moved from one office door to the next, each time banging on it or trying to open it until someone opened the door. The availability of the summoned personnel was thereby nicely displayed by how far the doors were opened (when they were opened at all). On some occasions the doors were opened so that the resident could enter the room (e.g. for teaching); at other times the employee positioned themselves in the door, offering help but no access to the room (Fig. 6). Sometimes the employees just put their head through the door and informed the adolescent that they would send someone else for assistance. The employees treated knocking-on-the-door as either a request for permission to enter the room or as a request for help to become involved in an activity. In response, they played the role of gatekeeper.

Intercepting

The last examples demonstrated how the residents' activities were shaped by their knowledge of the institutional routines at the center. The adolescents showed a strong awareness throughout the day of whom to find, when, and where. Some of the residents used this knowledge strategically as, for example, two residents who regularly moved to the corridor when the staff's shift started and ended in the morning or afternoon. The adolescents *intercepted* the employees on their way to work, greeted them, and engaged in brief small talk. During this exchange, the employees often commented on something personal about the residents; for example, complimenting a new blouse or asking about the previous night or events that would happen during the day. In return, the residents asked the employees questions, thereby receiving personal attention, engaging in relational work with the employees, and becoming informed about who was working that day and what was happening at the center.

4.3 Participation Roles: Ratified Participant, Bystanders, and Spectators

The described practices not only demonstrate the adolescents' wish for social contact and activity but also their resourcefulness and inventiveness in finding and engaging in social interaction and activities. Comparing the different practices, we can identify three participation roles the adolescents took.

As part of a focused encounter, an adolescent could become a *ratified and addressed participant* who was actively engaged in contributing to the ongoing conversation, and was addressed by the other participants. This included adolescents who reached out to by passers in the practice of being available, or adolescents who mingled with others in the corridor or intercepted employees as they started their working day. This position was different to that of the *distant spectator* monitoring the corridor, who was located on one end of the corridor and displayed himself or herself to be a single spectator keeping distance to the ongoing encounter in the corridor. We also observed adolescents who were seeking a participatory role between both engagement forms. They were seeking physical proximity to others but not social interaction. One of the researchers, for example, was talking to an employee when the girl stopped a short distance from them. The researcher was confused, as she interpreted the proximity of the girl as a wish to communicate, but neither the employee nor the girl attempted to start a conversation. The researcher turned to the girl and asked her if she could help, but the girl shook her head and stepped back, maintaining her distance. This hybrid participation status as neither a full participant nor a distant spectator was observed several times and could be described as *ratified bystander* or *overhearing participant*.

These examples show the adolescents' strong interest in being part of social situations, but also their different levels of interest in being involved in the ongoing interactions. The adolescents' interest in the immediate presence of others did not necessarily mean that they also wished to be engaged in a focused interaction. This aspect must be addressed by an interactive technology to meet the adolescents' ways of engagement in social encounters.

5 Discussion and Conclusion

Our study shows that young people with brain injury seek the corridor in their residence center to engage in social encounters and/or activity. The main corridor is a

primary route through the center and connects different rooms/spaces, activities and people. Various people frequently use it, and it offers not only a location to meet others but also a place to be part of or observe social encounters initiated by others without knowing who would participate. This *chance for sociability* distinguishes the main corridor from other places in the center and emphasizes its importance for social and informal learning. Thus, it offers an opening for the implementation of technology that supports these forms of learning for those who have difficulties in accessing them. Considering that corridors are a mundane and central part of many educational settings that offer various forms of learning, it is amazing that research on SLEco has not paid more attention to them.

However, this learning needs to be aware of the special interaction patterns on a corridor. Comparing the described interaction and participation patterns of the corridor with the classical classroom interaction, the typical space to implement SLE, we can see that social interactions have very different structures that need to be considered when designing and implementing SLEco. Typical features of classroom interaction are the asymmetrical distribution of knowledge, asymmetrical access to conversational resources, and different participation roles in the ongoing interaction; for example, are classroom interactions typically mostly structured by a 'knowing' teacher, opening and closing interactions and delegating and assessing tasks [83]. Research on corridor activities and our study identify the corridor as a 'circulation space' [40:46] and demonstrate that interaction patterns on the corridor are more episodic, fluid and unscheduled in their appearance and duration. Corridor interactions allow for various participation frameworks between employees and residents (and guests) that are more equally structured in regard to who interactional turn-taking, content, and knowledge transfer. Most are not long in duration, are often open for newcomers, and allow for split attention. As SLEcos aim to transform institutional spaces connecting different places across an institution, SLEcos need to be sensitive to the specific interactional and spatial structures of participation.

Another aspect, our study points out, is the importance of reconsidering our understanding of participation and involvement with a technology. The participation patterns we observed on the corridor do not allow for the standard idea of a single user whose full attention is directed to a certain SLE. On the one hand, corridor interactions are socially situated interactions that take place where people are, and the question arises how a SLEco can address the different participation roles. This is not special to corridor interactions; classroom interactions are also typically socially situated. We must start to understand participation in SLEcos not only in terms of dyads such as user-device, teacher-pupils, but also in terms co-workers, spectators, helpers, commentators, evaluators, etc. and consider how these participation roles can be taken into account in the usage of the technology (see also [84]). On the other hand, we could describe concrete participation patterns of how the young people with brain injury engage in social encounters; by *being-available, mingling, monitoring, scanning, intercepting and summoning*. The different practices encompass different degrees of participation in the social encounter depending a) on the availability of the other and b) the physical distance to / engagement in the social encounter and c) the degree in which the adolescents participate in the encounter. The question now is how these participation structures can be included in a SLEco so involvement, interaction and participation is constructed by the terms of young people and not the ideal idea of full attendance and participation by the designer of the system. A first trial can be seen in Christensen, Rodil and Rehm [17].

Based on our experience, we suggest that any SLEco for young people with brain injury and CP needs to consider the role of the caregiver or others who maintain the system and make it accessible for the young people. The power of a SLEco to support young people with brain injury in social and informal learning is therefore deeply

rooted in defining where, how and when they can independently access what kind of activities in what kind of participatory role.

Acknowledgements. We thank the participants of the study for their collaboration and support.

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