The significance of flexible learning spaces and student-centred pedagogies in school settings: A comparative case study

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This paper reports the findings of a case study that examined the importance of flexible learning spaces and student-centred pedagogies for facilitating effective teaching and learning in schools. By exploring the arrangement of learning spaces at the school level, the study compared a case school in Germany with the Future Classroom Lab Model. Data collection involved observations, photographs and video recordings, which were analysed through content analysis. The article demonstrates the alignment of pedagogies with seating arrangements and physical learning spaces by defining the pedagogy employed in a specific course and providing sample course activities. This paper offers suggestions for redesigning and implementing active learning classrooms, emphasising the need to increase flexible learning spaces in schools to enable student engagement with content through student-centred pedagogies. The case study findings underscore the significance of conducting assessments on classroom redesign initiatives.

Keywords*: Active learning; classroom redesign; comparative study; learning environment; pedagogical approaches; physical learning spaces; school settings*

INTRODUCTION

The dichotomy between teacher-centred and learner-centred approaches has been the subject of considerable debate in education research. Traditional teaching, also known as conventional teaching, represents a form of instruction where teachers and students engage in face-to-face interactions within the classroom setting (Altun, 2012). Students are assigned specific seats in such classrooms, and the teacher, rather than the students, determines the classroom arrangement. In teacher-centred education, the teacher assumes a central role, employing techniques such as lectures, facilitated discussions, quizzes and demonstrations (Shulman, 1986). By utilising these methods, the teacher aims to capture students' attention and stimulate their interest in the subject matter. In this conventional educational approach, students are expected to remain seated throughout the lesson while the teacher delivers content, leads discussions, and focuses on the mastery of material from textbooks and notes. The teacher's objective is to transmit a predetermined set of information to students, who are then assessed based on their ability to replicate or transmit this knowledge back to the instructor or an evaluating body (Li, 2016).

However, the limitations of traditional education have become increasingly evident, as it often restricts opportunities for innovative thinking and fails to address individual differences among students. Although traditional education may be effective in specific contexts, it is essential to

acknowledge its shortcomings and strive for progress (Li, 2016). One of the main drawbacks of teacher-centred instruction is its emphasis on the teacher as the sole source of information, the authority on reality and the ultimate judge of student learning. In this perspective, the teacher's responsibility primarily revolves around imparting a specific body of knowledge to students in a predetermined order, with the goal of maximising academic achievement. For instance, when a teacher delivers a lecture on the properties of a specific class of polygons, such as triangles, it exemplifies teacher-centred instruction.

In recent years, the traditional classroom environment has witnessed transformations in many areas, with the integration of information and communication technology (ICT) and multimedia tools. This shift has prompted a re-evaluation of teaching practices, with teachers transitioning from being mere knowledge disseminators to facilitators of learning (Horne-Martin, 2002). They assume the role of guides, encouraging students to actively seek additional information, addressing misconceptions, and providing opportunities for critical thinking and perspective-sharing (Bell, 1993). This learner-based approach focuses on the unique backgrounds, abilities, attitudes and beliefs that students bring to the classroom. It acknowledges the significance of diagnostic teaching, which involves uncovering students' thoughts on a given topic and creating an environment that allows them to refine and readjust their ideas (Bell, 1993). Notably, the effectiveness of educational communication is strongly influenced by the context in which it occurs, including the timing and physical environment (Bautz, 2018). Thus, teaching and learning in schools are deeply intertwined with the space and time in which they take place (Crook & Mitchell, 2012).

Nevertheless, it is important to acknowledge that the learner-centred approach is not a universally applicable solution nor the sole method in all educational contexts. Schweisfurtha (2013) challenges the notion of perceiving learner-centred education (LCE) as an absolute and singular model, arguing that its benefits described in existing narratives may not be accessible to most learners in developing nations. Implementing LCE through policy reform presents considerable challenges, indicating that some aspects of instructional practices may be emphasised differently based on cultural settings (Schweisfurtha, 2013).

Classrooms or learning spaces are catalysts for creative practices and significant positive changes within the education system (European Schoolnet, 2021). In the contemporary changing classroom, students are encouraged to make decisions about their learning process, such as determining the time they allocate to daily tasks based on curriculum objectives. The physical arrangement of the classroom plays a crucial role in supporting these student-centred approaches. Instead of being confined to their desks for the entire day, students have the freedom to move around, change seats, collaborate with peers and engage in effective communication (European Schoolnet, 2021). Educators can enhance student learning outcomes and facilitate greater student engagement by reimagining the classroom as a space incorporating technology, pedagogy and adaptable learning environments (Mishra & Koehler, 2006; Saralar-Aras, 2022).

At the heart of a learner-centred curriculum lies the concept of student engagement. Educators can foster a deeper understanding and retention of knowledge by actively involving students in learning and providing opportunities for exploration, critical thinking and collaboration (National Research Council, 2000). The learner-centred approach recognizes that students bring their own unique experiences, perspectives and prior knowledge to the classroom. As a result, teaching should be responsive to individual differences and offer personalised pathways for learning. This approach not only empowers students to take ownership of their education but

also promotes the development of crucial 21st-century skills, such as critical thinking, problem-solving and effective communication (Partnership for 21st Century Skills, 2004, as cited in Guo & Woulfin, 2016).

The study reported in this paper centres on the Future Classroom Lab (FCL) (Belgian model) and its implementation within a German school setting, particularly at a Case School in Bayern. Observations were conducted within the context of a Turkish language and culture course, establishing a multifaceted backdrop that significantly enriched and complicated the research analysis. The study explored each approach's underlying philosophies, instructional practices, and outcomes. The study aimed to compare and contrast the teacher-centred education approach prevalent in an FCL Class (a specific educational context) with the learner-centred education approach adopted in a class in Germany. By examining these two distinct educational paradigms, the study sought to gain insights into their strengths, limitations and implications for student learning and academic achievement.

In summary, the shift from traditional, teacher-centred education to learner-centred approaches reflects a growing recognition of the importance of individualised learning, student engagement and technology integration in the classroom. As the study delves deeper into the comparison between an FCL Class and a class in Germany, it sheds light on the evolving landscape of education and the potential for transformative educational practices that prioritise the needs and aspirations of learners.

LITERATURE REVIEW

This section reviews the literature on active learning and the relationship between classroom design and student engagement. It begins by defining active learning and highlighting its significance in equipping students with essential skills employers seek (Fitzsimon, 2014). Active learning is any method involving students actively participating in tasks and reflecting on their actions (Bonwell & Eison, 1991). Various instructional techniques are suggested to encourage active learning, including small group discussions, peer questioning, cooperative learning, problem-based learning, simulations, journal writing and case-study teaching (Barkley, 2010; Prince, 2004). Active learning transforms students from passive recipients to active participants, enhancing their focus, communication skills, motivation for critical thinking, creativity and overall course achievement (Habib, 2017).

The literature highlights the connection between classroom design and student engagement, with active learning approaches consistently shown to result in higher engagement and improved learning outcomes compared to more passive, teacher-centred approaches (Freeman et al., 2014; Hake, 1997; Michael, 2006; Prince, 2004). Classroom design is a significant factor that can impede or facilitate engagement, emphasising the need to explore the association between classroom design and student engagement (Barkley, 2010).

Studies investigating the relationship between classroom design and student engagement have yielded valuable insights. Monahan (2000; 2002) introduces the concept of 'built pedagogy', which describes classroom design as a physical representation of educational theories, philosophies, and values. Cortose (2005) highlights the impact of classroom design factors such as natural light, acoustics and comfortable seating on student engagement and academic performance. Grimes and Warschauer (2008) examine the positive effects of well-designed classrooms equipped with laptops on student motivation and active participation. Barret et al. (2015) find that well-designed classrooms with appropriate lighting, temperature control and flexible furniture arrangements positively influence student engagement. Lieberman (2016)

focuses on the relationship between the physical school environment and student engagement in physical activity, emphasising the importance of incorporating spaces for movement. Rands and Topf (2017) highlight the role of classroom design in fostering interaction, community and stronger personal connections between students and instructors, enhancing student engagement.

The reviewed articles provide compelling evidence of the significant influence that classroom design has on student engagement within educational settings. Effective classroom design, incorporating factors such as lighting, temperature regulation, adaptable furniture layouts, technology integration and provision of spaces for movement, has consistently been shown to enhance student engagement and promote positive learning outcomes. Educators and school administrators should consider these findings when developing plans and designing classroom environments to establish settings that encourage active participation and optimise student engagement.

To further explore innovative approaches to classroom design, the FCL in Brussels is introduced as a reconfigurable teaching and learning space developed by European Schoolnet (EUN) (European Schoolnet, 2016). FCL represents a model or approach to classroom design that emphasises flexible learning spaces, innovative use of technology, and learner-centred pedagogies. It comprises six learning spaces: investigate, create, present, interact, exchange, and develop (European SchoolNet, 2016; Law et al., 2017) (refer to Figure 1). These spaces are designed to support different activity types, encourage collaboration, foster creativity, promote communication, facilitate teamwork, enhance global citizenship, and empower self-directed learning.

Figure 1: Six learning spaces (EUN, 2016)

The investigate space serves as a research environment that fosters critical thinking and problem-solving skills through research, project-based learning and inquiry-based learning. By incorporating flexible furniture and relevant technological tools, this space promotes

experiential learning and hands-on exploration. It provides students access to diverse resources, including books, computers and online databases, encouraging them to delve into and investigate topics of interest. The physical arrangement of this space facilitates individual and collaborative work, enabling students to collaborate, exchange ideas and critically analyse information. Consequently, the investigate space nurtures curiosity, problem-solving abilities and independent thinking.

The create space functions as a production environment that supports and encourages creativity. It enables students to engage in realistic knowledge-generation activities that have practical applications in the real world. Within this space, students participate in tasks involving output production, analysis, teamwork and evaluation. Equipped with tools, materials and technology, the create space empowers students to design, prototype and construct their ideas. This environment fosters innovation, experimentation and the development of practical skills, leading to a deeper comprehension of concepts through active engagement.

The present space serves as a platform for communication and interaction among learners during the learning process. Its design facilitates effective communication and feedback exchange. Students utilize this space to share their work, present their ideas and receive feedback from their peers. Equipped with presentation tools, such as screens, projectors and audio equipment, the present space enables students to deliver their work effectively and develop effective public speaking skills. This environment cultivates confidence, oral communication abilities and the capacity to articulate and defend one's ideas. Additionally, it supports online broadcasting and sharing.

The interact space is designed to promote active participation and interaction between teachers and students in a traditional classroom setting. This space emphasises the synergistic effects of employing active learning pedagogies and technologies that encourage diverse forms of participation. Instead of the traditional model of teachers selecting students to answer questions, the interact space encourages all students to contribute their own unique responses to the subject matter. Technology offers a range of options to ensure that each student's voice is heard. Collaboration and teamwork are emphasised in the interact space, which is designed to facilitate group discussions, debates and problem-solving activities. This space's flexible seating arrangements and interactive technologies support student collaboration, communication and negotiation skills. Ultimately, the interact space promotes social interaction, cooperation and the development of interpersonal skills necessary for effective teamwork.

The exchange space is a collaborative environment to enhance teamwork, game-based learning, brainstorming and collaboration. It can be utilised for both face-to-face and online interactions, either synchronously or asynchronously. This space encourages idea sharing and collaboration, facilitated by suitable furniture and classroom layout. ICT is pivotal in enabling a wide range of communication and collaboration activities (Davidsen & Georgsen, 2010). The exchange space is dedicated to fostering cultural diversity, promoting global citizenship and facilitating the exchange of ideas. It provides opportunities for virtual or physical connections with students from different regions or countries, encouraging collaborative projects and discussions. The exchange space broadens students' perspectives, fosters inclusivity and develops skills necessary for global citizenship.

The develop space serves as an informal learning and self-reflection environment where students can work independently at their own pace using personalised learning tools, learning diaries and portfolios. This space encourages students to develop their metacognitive skills and adopt strategies for lifelong learning. It offers access to personalised resources such as online courses, tutorials and learning platforms, allowing students to pursue their interests and develop

skills according to their individual preferences and timelines. The develop space promotes autonomy, self-regulation and the cultivation of habits for lifelong learning, thereby preparing students for continuous learning in the digital age (Darling-Hammond et al., 2019).

By incorporating these learning spaces into educational settings, educators can facilitate active learning experiences and create environments that cater to the diverse needs of students. These spaces are designed to foster critical thinking, problem-solving, creativity, communication, collaboration, and self-directed learning skills. They provide students with opportunities to engage actively in their learning process and develop essential competencies required in the 21st century.

The relationship between the FCL and active learning strategies lies in the fact that the design principles of FCL align with and enhance the implementation of active learning approaches. The flexible learning spaces within the FCL allow for versatile seating arrangements and mobility features. FCL is characterised by its adaptable furniture and spatial configurations, allowing educators to rearrange seating and learning spaces to suit various instructional needs. This adaptability fosters a dynamic learning environment, promoting collaboration, engagement and personalised learning experiences. Additionally, mobility features such as lightweight, easily movable furniture enhance the FCL's capacity to support different teaching styles and activities, contributing to its effectiveness in modern educational settings. The practical implications of FCL design extend to its adaptability within the educational context, enabling educators to create versatile and learner-centred environments. This adaptability not only enhances student engagement and collaboration but also supports a variety of teaching methodologies, ultimately fostering more effective and dynamic learning experiences (Saralar-Aras, 2021).

Schools in Germany and comparison with FCL

Over 30 years ago, Spindler and Spindler (1987) conducted a study highlighting German classrooms' distinct characteristics. They described German classrooms as enclosed spaces with well-defined boundaries and systems. These classrooms focused on control, correction and homework delivery, and teachers aimed to minimise interruptions between tasks and efficiently utilise lesson time. However, in recent years, there has been a shift in German schools towards supporting student learning and providing a broader framework for achieving educational objectives. Classrooms have been redesigned to accommodate this mission and offer students different pathways to reach their goals.

In many German classrooms, desks are arranged in rows facing the blackboard, with enough space for two students to sit side-by-side (Refer to Figures 2 and 3). This traditional classroom layout, which has remained essentially unchanged for over 200 years, follows a geometric pattern that ensures every student can see the instructor and the blackboard. This layout reflects Lakoff and Johnson's (1999) metaphor that 'understanding is seeing', which suggests that visual perception plays a vital role in comprehension. It emphasises the importance of students visually observing the instructor, reading text or viewing visual aids to acquire knowledge and understanding.

However, contrasting with the 'understanding is seeing' perspective, another concept, known as 'understanding is doing', aligns more closely with the FCL concept. This perspective emphasises active engagement and hands-on experiences in the learning process. It recognises that learning is not solely dependent on passive observation but also involves active participation, problem-solving, and practical application of knowledge.

While both 'understanding is seeing' and 'understanding is doing' hold validity in different educational contexts, the traditional classroom design has historically prioritised visual and auditory learning modes, often undervaluing active engagement and experiential learning. The shift towards 'understanding is doing' calls for classroom spaces to facilitate active learning strategies, including flexible learning environments that allow for movement, collaboration, hands-on activities and technology integration. Such spaces promote student agency, critical thinking, problem-solving and the application of knowledge in practical contexts, ultimately enhancing overall engagement and deepening understanding.

Figure 2: A typical traditional classroom in Germany

The seating arrangement in a typical German classroom is designed to enable easy student interaction. The desks are light enough to rotate easily, and there are tables with wheels. This design allows students to see visual presentations and fosters mobility during independent work periods or when obtaining new materials. These materials are usually stored in the teacher's desk or cupboards, and students can access them independently or seek assistance from the teacher.

A teacher's desk is typically in front or slightly to the side of the blackboard (Refer to Figure 4). Using desks for two pupils allows activities to be performed in pairs, promoting collaboration. The seating arrangement in a regular German classroom can also be adapted for different activities, similar to the flexibility emphasised in the FCL. For example, the seating arrangement can fragment the class into small study groups, creating an ideal environment for various well-known small-group active learning methods.

While traditional German classrooms have historically focused on visual access and control, there is a growing recognition of the importance of active learning and experiential engagement. This shift in perspective calls for classroom designs that support active learning strategies and provide flexible environments conducive to collaboration, movement and practical application

of knowledge. The FCL concept aligns with these principles by emphasising learner-centred pedagogies, innovative use of technology and adaptable learning spaces.

Figure 3: Materials in a typical German classroom

Figure 4: A typical traditional classroom in Germany

A case school in Bayern

Bayern, located in the south-east of Germany, is an officially recognised federal state. With a land area of 70,550.19 sq km, it is the largest state in Germany, covering approximately one-

fifth of the country's total land area (Nations, 2008). Bayern has its own school system that aims to provide an individual educational path for every student (Die Grundschule in Bayern, 2011). The primary school observed in this study is a government-run institution that promotes the German language and fosters a love for reading (Leseförderung-Freude am Leben Wecken, 2022). The school uses open spaces to facilitate student learning to support these goals.

In Bayern, parents are recognised by the teachers who actively participated in research studies as having shared responsibility for the upbringing and education of their children (e.g., Niesel & Griebel, 2007). The school values parental input and incorporates their ideas in decision-making processes. The school aims to honour each student's talents and abilities through scientific, musical and sporting activities and projects. An atmosphere of comfort, mutual appreciation, respect and open communication is fostered among parents, teachers and students involved in the school. Teaching, learning, celebrating and living together are enjoyable experiences within this flexible school environment. The engagement of staff, students and other users of school buildings is considered essential for successful environmental changes that influence behaviour, well-being and achievement (Higgins et al., 2005). Figure 5 illustrates an area within the school that promotes freedom for students to learn at their own pace and supports the development of lifelong learning skills, resembling the 'develop' space in the FCL model.

Figure 5: Book exchange shelf on the third floor as a reading school profile component

The corridors in the school are designed as an extension of the classroom, providing spaces for collaborative learning that align with student-centred pedagogies suitable for a modern knowledge society. These corridors serve as exchange spaces where parents, teachers and students engage in teamwork, material exchange and peer observation. The school community values the achievements of everyone involved in school life, including academic accomplishments, extracurricular achievements and any form of success or progress made by students or teachers. This recognition of achievements fosters a positive and supportive environment, promoting motivation, self-esteem and a sense of belonging. Consequently, it contributes to a culture of collaboration, respect and continuous growth.

As noted by Higgins et al. (2005), teachers' attitudes and behaviour significantly influence how space is utilised within the school; teachers in the observed school employed various methods, new media and differentiated instructional approaches during lessons. The school's educational policy focuses on developing students' independent work skills, media literacy and knowledge

acquisition through diverse methods, new media and differentiated instructional offerings. For example, Figure 6 showcases a computer studio within the school that facilitates the development of e-safety skills and integrates technology with pedagogy.

Figure 6: A computer studio

Various activities take place in the computer studio. One such activity involved a mathematics topic, specifically multiplication. The interdisciplinary study aimed to connect mathematics with language courses. While the class was reading a book featuring a character studying mathematics, the students themselves engaged in mathematics activities. They participated in a digital multiplication game created using the LearningApps web tool. Figure 7 is a screenshot of a tool depicting students practising multiplication tables. The command in the figure states: 'We are learning the multiplication table with Pippi Longstocking'. The exercise involved matching mathematical operations (e.g., 4 x 5) with their results (20).

Overall, the observed primary school in Bayern exemplifies the implementation of innovative educational practices. It leverages open spaces, incorporates parental involvement, fosters a supportive school culture, utilises modern technology and promotes interdisciplinary learning. The school embraces student-centred pedagogies and emphasises the development of essential skills for lifelong learning.

Figure 7: Digital multiplication exercises

METHODS

The study reported on in this paper employed a comparative case study research method (Yin, 2014) to examine a primary school in Germany that represented a blend of traditional and future educational concepts. The school was compared and contrasted with the learning lab model of the FCL, focusing on the physical layout of the school building, learning spaces and related pedagogical practices. Interpretive observations were conducted to explore students' utilisation of school spaces and their impact on course participation. The activities within the school emphasised learner-centred and inquiry-based approaches, technology-enhanced learning, student autonomy and interdisciplinary learning.

Data for the study were generated through a series of observations conducted in primary classes. The participants were students who voluntarily enrolled in the Turkish language and Turkish culture (TTC) course. The TTC course served as an example curriculum and catered to students of varying ages (ranging from 6 to 14 years) and language proficiency levels. The total number of students involved in the study was 63, with 27 males and 36 females. To accommodate the diverse student population, a balanced use of various teaching approaches and techniques, such as cooperative learning, group work, individualized instruction and interest- and level-based grouping, was employed to encourage active student participation. The learning spaces within the school were utilised to facilitate active learning, as observed in this study.

Additionally, teachers implemented peer and group evaluation strategies to assess individual and group behaviours, considering the varying age groups. Self-assessment practices were also incorporated to enable students to reflect on and recognise their competencies. The lessons conducted within the TTC course had a duration of 90 minutes.

The design of the TTC course curriculum considered the needs of Turkish children, teachers, and parents residing abroad. To ensure that the curriculum objectives aligned with the 'real'

needs, in-depth interviews were conducted with eight Turkish children, their parents and Turkish language and Turkish culture teachers residing in Switzerland, France and Germany. These interviews served as an initial step in the curriculum development process. The data collected from the interviews were used to develop a scale, which was then implemented on-site. The findings from the interviews and the scale aided in identifying the curriculum objectives and determining the themes that should be addressed to achieve these objectives (Ministry of National Education [MoNE], 2018). The program was not prepared by the case school. The curriculum was created by the Turkish Ministry of National Education, while the school only offered physical space.

FINDINGS

The findings of this study highlight the transformative impact of a holistic learning environment, as exemplified by the FCL, on student empowerment, pedagogical integration, and the integration of innovative technologies. The implementation of dedicated learning spaces, such as the Investigate, Create, Present, Interact, Exchange, and Develop spaces, facilitated diverse learning activities and promoted student agency for self-directed learning. Through integrating pedagogies like inquiry-based and project-based learning, along with the use of technologies such as augmented reality and artificial intelligence, students actively participated in collaborative activities both within and beyond the physical boundaries of the classroom. The provision of presentation spaces, including traditional classrooms, corridors, and school gardens, enabled students to showcase their work and develop essential presentation and socio-communicative skills. Furthermore, integrating technology in language learning enhanced language proficiency, ICT practices, communication experiences and collaboration. The Create space fostered students' creativity, critical thinking and problem-solving skills, while the Collaboration and Exchange spaces facilitated global connections and intercultural communication. Overall, the holistic learning environment and associated learning spaces promoted student engagement, motivation, and the acquisition of 21st-century skills necessary for success in the digital age.

Empowering learners through a holistic learning environment

The holistic learning environment implemented in the FCL empowered learners by equipping them with the necessary tools and resources for communication and construction. For instance, students were provided with state-of-the-art technology, such as interactive whiteboards, tablets and multimedia content libraries, that facilitated seamless communication and collaborative activities. The learning design prioritised sharing and collaboration, fostering student agency for self-directed learning. For example, students were encouraged to work on cross-disciplinary projects where they had to collaborate, conduct research and present their findings, promoting critical thinking and problem-solving skills.

The dedicated spaces provided within the FCL facilitated various types of learning activities, including inquiry-based learning, project-based learning, collaboration, communication, cultural exchange and self-directed learning. For example, students had access to dedicated inquiry zones equipped with research materials and tools to explore their interests. Additionally, project-based learning was encouraged, with students working on real-world projects like designing sustainable solutions for local environmental issues. Collaboration and communication were actively encouraged through spaces designed for group work and discussions, such as breakout rooms and presentation areas.

Moreover, cultural exchange was fostered through virtual connections with classrooms worldwide, enabling students to interact with peers from different backgrounds and enhancing their global awareness. As the various examples exemplify, this comprehensive approach to learning spaces significantly enhanced student engagement, motivation and the acquisition of essential 21st-century skills, such as communication, critical thinking, creativity and cultural competency.

Integration of pedagogies and innovative technologies

The language courses at the case school incorporated diverse pedagogical approaches, such as inquiry, scenario-based, and project-based learning, along with integrating innovative technologies like augmented reality and artificial intelligence. The implementation of collaborative activities, both online and onsite, encouraged active student participation and positioned them as legitimate contributors within and beyond the classroom (Ratcliffe & Millar, 2009).

For instance, Figure 8 illustrates a collaborative small group activity where students worked together to create a virtual trip using scenario-based learning. Interactive scenarios facilitated active learning strategies, allowing students to engage in research, presentation creation, information exchange, and decision-making. Students were free to use any available object and space to contribute to the final product, which involved producing a stop-motion video recorded with a green screen.
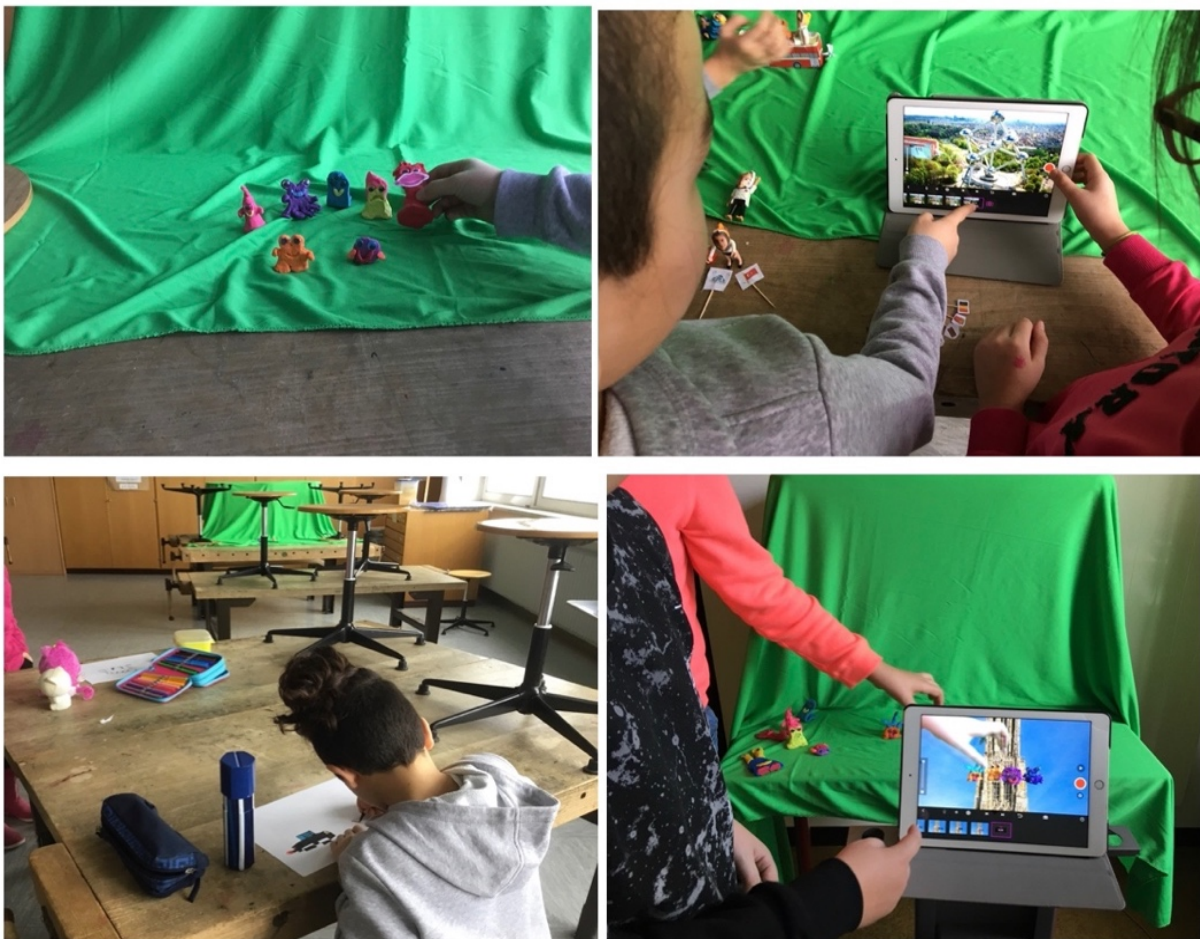

Figure 8: Small group work

Presentation spaces: Classroom, corridor and school garden

Students at the case school had access to dedicated spaces for presentations, including the traditional classroom, a presentation area in the corridor and the school garden. The corridor space demonstrated versatility, capable of being transformed into a conference hall as needed. Additionally, the school garden featured a theatre-like space that could be utilised for presentations and performance shows (Figure 9). Technological devices further facilitated interactive presentations. Students had the flexibility to choose any physical area they desired for their presentations, enabling the development of presentation and socio-communicative skills, and engaging a wider, authentic audience through the class project blog (Yeşil, 2020; MoNE, 2021).

For instance, when students actively engaged with dedicated presentation spaces during their math lessons to showcase their financial budgeting projects, the presentations served as practical applications of their mathematical skills. They allowed students to effectively demonstrate their understanding of financial concepts and budget planning. Such experiences underscore the adaptability of the learning environment and its positive impact on students' comprehensive development.

Figure 9: Different *present spaces* shown in the classroom, corridor, and the school garden

Furthermore, in the context of a TTC course at the Case School in Bayern, students enthusiastically participated in presentations demonstrating their grasp of Turkish culture. These presentations promoted cultural awareness and encouraged students to express themselves creatively and engage in cross-cultural dialogues. This experiential learning approach illustrates how the FCL model can effectively support various educational objectives while fostering SCL.

Integration of technology in language learning

In line with the TTC course objectives, students utilised digital devices such as mobile phones and tablets to create talking avatar videos to present their favourite activities and discuss their families (Figure 10). Technology was seamlessly integrated into activities to enhance the learning process and the resulting products. Students utilised free Web 2.0 tools, recorded their voices and shared their creations, thereby fostering language skills, ICT practices, communication experiences, collaboration, teamwork, creativity and imagination (Wagner, 2009).
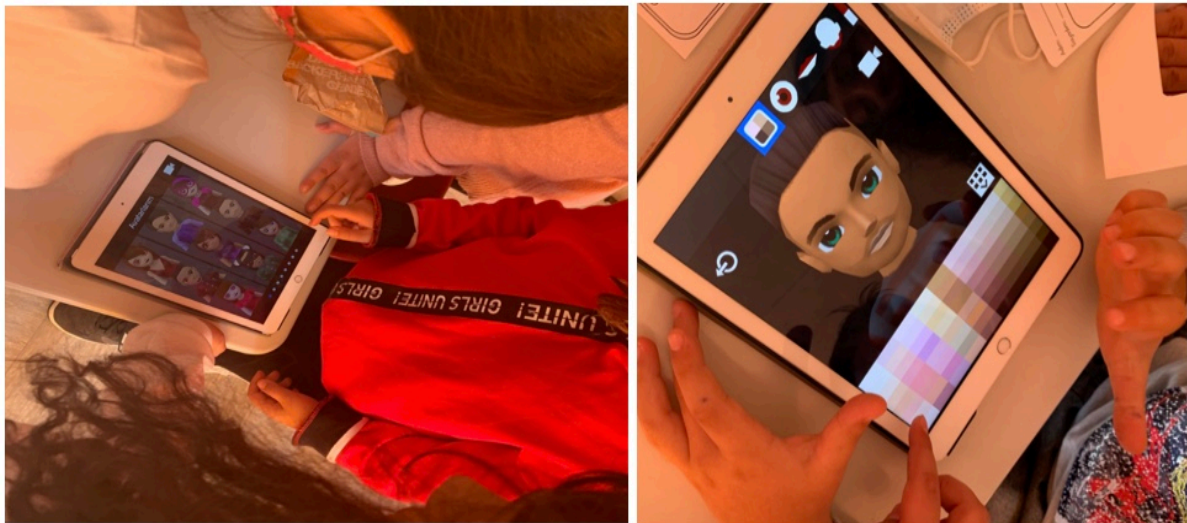

Figure 10: Avatar creation

Create space: Building dream houses

Another notable project in the TTC course involved students working in teams to design and create their dream houses. This inquiry-based learning activity encouraged students to identify and research issues and questions relevant to their projects. Through drawing, utilising the Cospaces Edu platform, singing and expressing their desires, students developed their knowledge, spatial intelligence, musical intelligence, and intrapersonal intelligence (Gardner & Hatch, 1989). The project aimed to foster different types of intelligence and improve 21st-century skills such as creativity, critical thinking and problem-solving (Saralar-Aras, 2021) (Figure 11).

Figure 11: House project in Cospaces Edu as an example of the Create space

Collaboration and exchange space: Global connections

Collaboration extended beyond the physical boundaries of the classroom, providing students with opportunities for global interactions. They engaged in video conferences with classrooms in different countries, exchanging ideas, playing digital games and developing socio-communicative skills (Figure 12). A multidisciplinary approach was adopted by combining reading activities with other disciplines, allowing students to connect their learning to sociocultural and contextual situations. This approach promoted concepts such as different languages, equality, cooperation, intercultural communication, common life, sharing, respect, harmony and reconciliation (MoNE, 2021).

For instance, students collaborated to explore daily life rules during a short-term project with Greece. Online meetings were conducted via Skype to foster communication and brainstorm about game and classroom rules. Students collectively created digital posters and used codable educational robots to implement and follow their rules. This interdisciplinary activity integrated core subjects, robotics and coding, thereby promoting problem-solving, critical thinking and collaboration (Figure 13). Interdisciplinary activities were encouraged, aligning with the principles observed in the Investigate space within the Future Classroom Lab.

Overall, implementing the FCL and its associated learning spaces resulted in significant learner benefits. The holistic learning environment, integration of pedagogies, innovative technologies and collaborative opportunities contributed to developing 21st-century skills, such as critical thinking, problem-solving, creativity, communication, and collaboration. Students actively engaged in their learning, taking ownership of their education and acquiring the competencies necessary for success in the digital age.

Figure 12: Videoconferences as an example of the Exchange space

Figure 13: Investigate space example in FCL

DISCUSSION

The design of learning spaces is influenced by various factors, including learning theories, educational objectives, student needs and teaching and learning activities (EUN, 2021). By creating flexible learning environments that move away from traditional classrooms, students and teachers experience a shift in their teaching and learning experiences, characterised by increased interactions and collaboration (Deed & Lesko, 2015). In the 21st century, teaching and learning extend beyond the physical confines of school buildings, thanks to the development of the internet and new technologies. Virtual spaces offer unique opportunities for interactive and immersive learning experiences (Merchant, 2013), allowing students to engage in new ways of learning and express their ideas through multimedia creation.

Incorporating technology into the learning process enables students to become active contributors to their learning environment, fostering higher-level critical thinking skills in an active learning setting (Yeşil, 2020). With the aid of well-selected digital tools, students have the agency to shape their learning experiences, accessing information anytime and anywhere

and learning at their own pace. This diminishes individual differences among students and promotes personalised learning (Yeşil, 2020).

The primary value lies in creating a supportive learning environment that promotes multidisciplinary, collaborative and interactive learning (Oblinger, 2006). Instead of simply presenting information from textbooks, teachers play a role in facilitating student agency and inquiry-based learning. They design activities that empower students and involve them actively in the learning process. Teachers become designers of opportunities for student coaching, inspiring new creations and fostering student participation and collaboration. Students are actively engaged in decision-making and collaboration, contributing to the outcomes of their learning activities.

Through project-based assessments and evaluations conducted in the classroom, it is evident that students internalise new vocabulary, develop teamwork skills and exhibit metacognitive abilities. Different learning spaces cater to different types of intelligences, addressing interpersonal and intrapersonal aspects. Students engage in self and peer evaluations, fostering their inclusion in the learning process. Furthermore, designated periods and structures for student participation enhance their identification with the school and develop their understanding of democratic principles. The feedback received from students about specific activities within projects demonstrates their enjoyment and engagement in diverse learning experiences

Learning is a process that occurs through activity, and students construct knowledge through their actions and interactions (Goodyear et al., 2021). The FCL offers various learning spaces that encourage specific activities aligned with different learning objectives. The different spaces, such as the Investigate space, Create space, Present space, Interact space, Exchange space, and Develop space, cater to diverse activity types and promote active, meaningful and purposeful learning experiences for students.

The case school's adaptable and open layout, along with the mobility of furniture, facilitates intellectual and social interactions among students and teachers. The increased movement and social interactions create a sense of community and enhance engagement. Participants noted the formation of connections and knowledge sharing within this interactive environment.

Encouraging student-centred activities in flexible learning spaces positively impacts students' emotional, cognitive and behavioural engagement (Kariippanon et al., 2018). Students participating in such activities demonstrate increased emotional engagement because they exhibit higher interest, enjoyment and motivation levels. Their cognitive engagement improves through enhanced critical thinking skills, deeper understanding of concepts and improved problem-solving abilities. Students' behavioural engagement increases, characterised by active participation, collaboration and self-directed learning behaviours. The positive feedback from students regarding project-based activities indicates their high level of satisfaction and willingness to participate in similar activities in the future.

In conclusion, the design of learning spaces is crucial in promoting student engagement, collaboration and active learning. Students can become co-creators of their learning experiences by integrating technology and providing flexible environments. The different learning spaces in the FCL cater to diverse learning objectives and foster specific types of activities. The adaptable and open layout of the case school promotes social interactions and community building. Encouraging student-centred activities in flexible spaces enhances emotional, cognitive and behavioural engagement. The findings highlight the importance of creating

supportive learning environments that empower students and foster their active participation in the learning process.

CONCLUSION

The findings of this study emphasise the importance of flexible learning spaces for promoting active student engagement and learning. The FCL model, with its various spaces for investigation, creation, presentation, interaction, exchange and development, guides educators in facilitating active learning experiences. The design of learning spaces and the integration of technology play a significant role in supporting educational goals, content delivery and teaching processes. Teachers can personalise the learning process and encourage active student participation by adopting innovative teaching practices and incorporating pedagogical approaches, such as cooperative learning, game-based learning, and interactive practices. Interdisciplinary activities and collaborative opportunities enable students to express themselves and engage in collaborative learning.

Moreover, the study's findings underscore the significance of flexible learning spaces, as the Case School in Bayern exemplified, for fostering active student engagement and facilitating meaningful learning experiences. The successful implementation of the Future Classroom Lab model at this institution is a compelling illustration of how adaptable learning environments can positively impact education, offering valuable insights for educators and policymakers seeking to enhance student-centred pedagogies.

However, it is important to acknowledge the limitations of this study because it focused on a single institution and a limited number of students. Other researchers may need to consider different contexts and larger sample sizes for further research. Nevertheless, the findings of this study contribute to the understanding that the design of learning spaces and pedagogical practices are interconnected and mutually influential. Students' engagement in defining and solving design problems in schools is crucial for creating flexible and adaptable learning environments that meet learners' evolving needs and curriculum demands.

The comparison between traditional classrooms and the FCL model reveals significant differences in terms of furniture arrangement, integration of technology, emphasis on collaboration and personalised learning approaches. Traditional classrooms tend to have fixed furniture and limited technology use, while the FCL model prioritises flexibility, technology integration and collaborative learning experiences. The case school demonstrates the possibilities of modifying the learning environment according to students' needs and striking a balance between traditional and innovative approaches. Furthermore, the study reveals a dynamic continuum between flexible and fixed learning environments, as the Case School in Bayern exemplified. This nuanced perspective challenges binary thinking and underscores the importance of balancing students' evolving needs while respecting traditional pedagogical foundations. The Case School is a valuable illustration of how educational spaces can evolve along this continuum, demonstrating the possibilities of adapting learning environments to maximise innovation and pedagogical continuity.

The connection between learning spaces and pedagogies is crucial for enhancing the quality of education. The physical attributes of the learning environment can influence students' motivation, engagement, social-emotional development, cognitive skills, and academic achievement. A well-designed learning environment supports and enhances students' learning experiences and outcomes. The case school exemplifies how efficiently using spaces can positively impact student learning. However, it is essential to remember that the learning

environment goes beyond physical attributes. Regardless of the setting, whether under a tree or in a high-tech classroom, the focus should be creating opportunities for meaningful interactions, collaboration, critical thinking and social-emotional development. The learning environment should be adaptable, inclusive and supportive of diverse forms of interaction, fostering a sense of community and mutual respect among learners. Ultimately, the goal is to create a conducive learning environment that prioritises active engagement and student-centred learning from the beginning to the end of the learning process.

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