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Teacher Perceptions of a 21st Century Classroom

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Abstract

Despite the uncertainty in the rapidly changing world, many countries expect their educational institutions to be ready for the future. To meet these expectations, educational policymakers bring in new changes. One of these transformational changes is the "Future Classroom Lab (FCL)," coordinated by the European Schoolnet with 15 countries, including the Turkish Ministry of National Education. These classrooms reconsider the changing roles of teachers and students, the traditional classroom layout, and propose solutions for more effective learning experiences for the 21st century. This study, based on the qualitative method, aims to introduce the opinions of teachers from different levels of education about future classrooms to determine what is expected regarding the new educational environments in terms of teachers, schools, students and classrooms. A case study design is used within the research, and criterion sampling is employed. The data is collected via semi-structured interviews. This study presents educational stakeholders with the desired framework concerning future classrooms in line with 21st century schools. The results imply that there is a need for new classrooms along with technology integration and pedagogy to keep up with the developing world. To achieve sustained growth, policymakers should focus more on technology-assisted, flexible learning zones and the technology competent leaders and teachers.

Key words: Educational Technology, School Management, Flexible Learning Zones, Future Classroom Lab, Classroom Design

Introduction

Each century brings in different paradigms of education and teaching strategies, which sometimes extend into the schools' and classes' design, along with renewed teacher qualities. Today's schools were shaped for the Industrial Age, but the classrooms of tomorrow will be shaped for the digital age (Arstorp, 2018). Before the 2000s, education was about teaching people something or solely a transfer of knowledge. In more recent years, it has become about making sure that individuals develop a reliable compass and evolved navigation skills in times of uncertainty (OECD, 2015). Therefore, it is not enough for educational institutions to only stay up to date since it cannot be anticipated how necessary the required skills for today's educational systems will be in 20 years (Barber & Mourshed, 2009). In line with this fact, a literature genre has begun to be formed around learning space design and educational methods for future classrooms (Pedro, Baeta, Paio, Pedro, & Matos, 2017; Sardinha, Almeida, & Barbas, 2017; Santally, Cooshna-Naik, & Conruyt, 2014). Additionally, OECD (2006) shared samples of modern designs and good practices for better learning facilities. However, there are not so many studies about uncovering future classes in terms of the teachers' perspective on future learning environments. Therefore, the researchers in this study wanted to focus on teachers' opinions to see a 21st-century classroom from their unique perspectives.

Educational systems need to innovate themselves to help teachers and students gain 21st-century skills and be actively prepared for the new century. To realize this effectively, policymakers reinterpret modern educational methods and implementations based on the current data. From there, they can introduce new teaching concepts with strengths attained from recent technological developments and pedagogical findings. Today, due to these reinterpretations, educational systems have been incorporating technology leadership, STEM education, flipped classrooms, digital literacy, distance learning, flexible learning environments, learning zones, and such. New understandings or changes in education like above will surely continue to surface, as it is essential for the educational priorities of schools to catch up with those of the developing world. These priorities actually cover

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even larger domains, such as revised teacher education, to newly designed classroom layouts. Keeping this in mind, this study examines teachers' perceptions on new classrooms along with technology integration and intended pedagogy to uncover what educators desire in future learning environments to keep up with the developing world.

Future Classroom Lab (FCL)

Based on the expectations from educational organizations for the future, policymakers need to find answers for questions such as, "What does society desire to attain, and with what kind of education? How will it be reached with what sort of human resources, physical status, and curriculum?" The Future Classroom Lab (FCL) initative, jointly coordinated by 15 countries in the European Schoolnet, is a network structured to seek answers to these questions in the educational field. Thus, the FCL is based on the reinterpretation of modern educational methods and their implementation, but with more focus on classroom designs and layouts. The concept of FCL promises a broad range of features, from course plans and leader qualifications to classroom design for the effective use of technology in education in the future. The FCL is formed as a living lab to support the changing styles in education and rearrange the traditional classrooms and other learning spaces, incorporating 21st-century skills into learning and teaching environments. Santally et al. (2014) mention living labs, like FCL, as an emerging model to support co-creative, human-centric, and user-driven research, along with development and innovation, to better cater to learners' needs.

According to the OECD Innovative Learning Systems Report (2015, p.4), two-thirds of teachers participating in TALIS consider current teaching spaces to work against innovation. According to the European Schoolnet report (Ayre, 2017), schools begin to realize that they do not produce versatile students in traditional classrooms, where teachers are to be placed in the front. Such classrooms do not provide innovative pedagogical approaches and outcomes. The report also states that traditional classrooms do not give students the chance to work in groups, carry out projects, and collaborate with those outside the classroom. On the other hand, the FCL allows students to take up various roles and manage project-based activities in collaboration within a flexible learning environment and supports students' innovation and creativity skills within the learning spaces.

The FCL is based on "the design of learning spaces" that allows students to gain and improve 21st-century skills by dividing the classroom into six different learning zones: create, investigate, develop, interact, exchange, and present (Ayre, 2017). These six zones are structured explicitly in a classroom environment, and teachers guide the process of learning in the zones suitable for students' learning experiences. In these classrooms, "pedagogy" and "technology integration" are the other main components of FCL. Any kind of technological tool and educational activity that is not supported by the appropriate pedagogy can be a waste of time. Therefore, it is a must to build consistency among "the learning spaces, pedagogy and the integration of technology" for active learning in the future classroom (YEGITEK, 2018), as shown in Figure 1.

Figure 1. The main components of new classrooms (Adapted from Steelcase Education, 2014)

According to the European Schoolnet Report by Ayre (2017) and Teacher Guidelines for Designing Future Classrooms issued by YEGITEK (2018), the six learning zones shown in Figure 2 could be summarized as follows:

1. Investigate: The Investigate zone is designed to encourage students to explore and be active participants rather than passive listeners. Teachers can use this zone to improve their students' skills in investigation, project-based learning, and creative thinking. It is important to incorporate appropriate furniture for flexible learning, data recorder, robots, microscope, online labs, 3D models, etc. to support students and their curiosity.

2. Create: Students need to be encouraged to internalize the content and resources created by others or do more than only recording information. In the Create zone, students are in a space where they can use their creativity to plan, design, and produce their own work. Students experience a sense of creating by using digital cameras, microphones, and video editing software for podcasts, animation, and media production.

3. Present: What students search and produce should be presented and submitted at the school. The Present zone encourages sharing results, interactive presentations, effective learning, and giving feedback. The students are encouraged to present via interactive boards, blogs, VLE, online websites, projectors, etc.

4. Interact: One of the challenges of the traditional classroom setting is getting all of the students actively involved in learning. In the Interact zone, teachers use different technological tools (interactive boards and screens, response systems, mobile devices, classroom management software, etc.) in different classroom layouts (students working in small groups) to improve creativity and student engagement.

5. Exchange: Student collaboration or peer-to-peer collaboration is one of the critical skills for the 21st century. This zone highlights the ownership and decision-making processes within groups, as well as responsibility. Peer-to-peer collaboration, teamwork for better inclusion, learning by playing, collaborating online, and brainstorming are the key points for the zone.

6. Develop: The Develop zone is a space for informal learning and self-reflection. Students can carry out schoolwork independently at their own pace. The zone could be used by teachers to support individualized learning approaches that allow students' self-directed learning and self-reflection.

Figure 2. The design of the Future Classroom Lab, incorporating six learning zones (Ayre, 2017, p.12)

The FCL, which resonates with inquiry and project-based learning strategies to a great extent, stands out with six zones in the classroom design. It offers a flexible learning environment, including innovative learning approaches, thereby creating an open culture and inspiring other learning environments (Ayre, 2017). Similar to the FCL model, various approaches and metaphors began to be incorporated into school designs (See, Thornburg, 2004). For instance, the Federation University in Australia metaphorically defines the learning zones

as ―campfire, watering hole, cave and mountain top" (PCW, 2017). Campfire: A space where teachers and students are together and share stories, opinions, and knowledge. Watering Hole: An informal space where students discuss and collaborate. Cave: A space where independent and reflective activities take place. Mountain Top: The space where the results of the activities are presented to the audience. In fact, the spaces offered by FCL or Thornburg (2004) offer concrete ways to achieve student-centered multi-dimensionality, rather than teacher-centered uniformity in the classroom.

Educational Leaders for the Future Classrooms

In the modern world, new innovative implementations' success can be ensured with a good management profile and well-planned pilot studies by school leaders. By creating innovation groups, schools can make a difference in adapting innovation in themselves and then leading other schools. If the school personnel and management adopt an innovation culture, deeper learning will be possible. Such change starts from scratch and systematically expands to the rest of the school (Freeman, Becker, Cummins, Davis, & Giesinger, 2017). Establishing a team under the leadership of a good management team that aims to achieve change and innovation in such schools plays an important role. It creates a common responsibility and culture of belonging to the change, and it supports the staff for innovating, risk-taking, and exhibiting an open mind that achieves more robust learning (Vecchia & Saltidou, 2018).

Today's leaders are increasingly expected to undertake leadership responsibilities in fields in which they are not well-informed (Flanagan & Jacobsen, 2003). FCL is an emerging example of innovation in education where classical leaders who are used to a classical classroom are supposed to introduce and welcome new educational environments. In these cases, the attitudes expected from school leaders are supporting innovation, changing the atmosphere for the new digital age, and increasing the staff's professional qualities. To do so, professional development opportunities should be provided. School leaders and teachers, supported by professional development opportunities, could create opportunities for students to take more responsibility, collaborate, participate in authentic learning experiences, and improve their 21st-century skills by adopting digital pedagogy (Assche, Anido, Griffiths, & Lewin, 2015). In this aspect, schools could become more equitable, productive, autonomous, and collaboration-centered institutions.

When school administrators care about professional training, use of technology tools in school, learning spaces, and scenario-based learning in classrooms, the intended achievement can be easily attained. The main goal is to foster high-quality student learning by these means at the school. Future classrooms, as in FCL, are not composed of merely technology, flexible furniture, and learning zones. In fact, the focus should be a thorough examination of how students learn so that they can better students' learning curves (Assche et al., 2015) using new contextual developments.

In many studies, ―the quality of teaching" is accepted as the main factor in student output; however, the evidence also shows that ―redesigned classrooms and innovative learning environments" have an important impact on learning programs as well (Wall, 2016). It means that the use of current approaches and implementations, like learning spaces, can foster a leveraged effect combined with quality teaching. Therefore, school leaders and educational policymakers have an essential role in establishing proper educational awareness. The macro-leaders and education planners should direct future classrooms in parallel with the current findings and appropriate pedagogy that support the quality of teaching.

Educational leaders emphasize that schools should move out of the Industrial Age with new learning spaces and evolve into a more student-centered structure (Freeman et al., 2017). Classrooms should be restructured into flexible learning spaces where multiple students can work together with more than one goal at the same time. Therefore, there is surely a need for effective leadership for future classrooms to maximize the benefits of such an environment. This will be achieved through the arrangement and professional development of teachers and school leaders, as well as knowledge sharing among schools (PWC, 2017) along with changes in classroom setting. The following questions were asked in this study regarding these considerations:

a) What are the teacher views and expectations regarding future classrooms?
b) What could be the needs of the teachers who will work in future classrooms?

Method

Research Design

This study is in the form of a case study, a design within the qualitative research method. The case study is used for the examination of programs, events, groups, etc. within a real-life context, with little control of the researcher over the case in question and context (Yin, 2002). Case studies search answers for ―how-, why-, and what-" related questions. In this study, ―future classroom" or ―new learning environment" is taken as the case, and the opinions of the teachers are taken to build or present a 21st century-based classroom model. The participants' views about these future classrooms are investigated within the teachers' expectations about future learning environments. The goal is to inform the policymakers and leaders about possible future classroom settings desired or envisioned by the teachers in line with 21st-century skills expected of the students. The reason that a case study is chosen as the method is that such an approach can better analyze the future classroom in depth from teachers' perspectives upon the arrival of classes like FCL or Smart Classes into educational discussions. The researchers in this study followed a comparative analysis upon two questions. They tried to present a possible framework for the future classrooms at the end of the study, where policymakers can find the participating teachers' expectations and their views of the desired class outlook, features, and student/teacher qualities they will need within these classrooms.

Participants

The study was conducted with 11 participants who completed training on the FCL during the 2018-2019 academic year. Criterion sampling is used. Criterion sampling means determining the criteria to include the most relevant sample in the study. It helps researchers select the sampling in line with research questions and intended measures and plans. The researchers determined the criteria according to the expertise in the target topic and thus assumed that the FCL Turkey Local Ambassadors and teachers who completed FCL trainings or participated in face-to-face FCL sessions in the regions as the most appropriate participants for this study.

FCL Local Ambassadors is the group of teachers from different cities in Turkey who completed training given by the European Schoolnet and Ministry of National Education. Teachers in this group are officially assigned as FCL Local Ambassadors. At the time of this study, there were 18 FCL Local Ambassadors, nine accredited FCL Schools, and 15,000 teachers from all over the country who were trained for at least six hours on the FCL approach through online sessions or introductory webinars. The researchers, one of them being the FCL Lead Ambassador in Turkey, mailed all FCL Local Ambassadors and teachers with solid experience in the FCL in their region or schools. Therefore, the interviews were carried out with eight FCL Local Ambassadors and three teachers who agreed to participate voluntarily in the study. Two of them were men; nine of them were women. Six of them were teaching in a secondary school; two of them were teaching in high school, and three of them were elementary school teachers. The participants were teaching courses in English (n=6), Turkish(n=2), Class(n=2), and History (n=1). There was no ethical conflict since the study was carried out within an international project (FCL) that was approved by the ministries of education in all the related countries, and research questions were based on the project's prioritized research areas. The participants were first asked if they would volunteer in the study.

All data collection was done in Turkey after the consent of each volunteering teacher was obtained. They were already involved in the FCL initiative, so the participants were willing to be part of the study. The researchers explained how long these interviews could last, their rights to withdraw and quit any time, and they were given tag names in interviews (Halise, Nesrin, Ayse, Hasan, Melisa, Meryem, Semra, Neriman, Duygu, Necmiye, and Mustafa) so that their anonymity can be maintained. The participants were informed about all these details in the consent-taking process by mail, phone, or in person. They gave their final consent as well before this study was sent for review.

Data Collection

The two questions given above were turned into a semi-structured interview format and presented to the participants. For the determination of the questions, the researchers made use of the existing literature and the questions out of project studies related to the FCL in Turkey. The teachers were asked in detail:

a) What type of future classes do you expect regarding the teachers, students, schools, contents, etc.?
b) What type of teacher qualities/needs in the future do you foresee?

These questions were accompanied by supportive questions similar to the main questions above for more clarification. The teachers were also asked to tell the difference between today's schools and future learning environments.

Data Analysis and Interpretation

The data is analyzed utilizing content analysis. Holsti (1969) defines content analysis as a technique used for deduction by identifying the designated features of the messages and texts objectively and systematically. While there are various definitions for content analysis, two important points that are emphasized by other researchers signify its ~~"s~~ystematic" and ~~"o~~bjective" aspects (Kocak & Arun, 2006). The answers to two questions were collected around two main topics according to the themes and patterns set out systematically. The researchers followed content analysis method to find similarities or differences in teacher opinions to form the most suitable framework for future classes. They analyzed all the answers and were faced with concurring codes under two main topics: Table 1) Teachers' views regarding future classrooms, Table 2) Teacher qualifications and needs for future classrooms.

Research Trustworthiness

In qualitative research, the researchers' ability to transfer the case or event in an objective, direct, and realistic way bears paramount importance (Yildirim & Simsek, 2016, p.269). Guba & Lincoln (1982) mentions four criteria for trustworthiness in qualitative studies: credibility, dependability, confirmability, and transferability. The researchers tried to tackle the possible validity and reliability issues by following strategies such as participant confirmation, showing distorted points, showing the limits of the research, quoting participant views in detail, etc.

Specifically, credibility was taken into account by member checking since direct quotations, interpretations, and conclusions are shared with the participants to take their ideas and consent. For transferability, a full/thick description was paid attention to since all the context for teachers, and their supplementing ideas were given. For dependability and confirmability, auditing the research data analysis was the main focus to provide consistency and neutrality (Korstjens & Moser, 2018). Since the research includes three researchers, they evaluated each section and wrote in company with the first author. There was a high consistency between the researchers' analyses, which was followed by mutual agreement about the non-consistent parts by integrating or replacing the code names for better data presentation. Besides, an expert opinion in qualitative data analyses was consulted for the evaluation of the themes and views; the whole research was presented, and feedback was taken for the final version from both the expert and participants.

Results and Discussion

Regarding the two research problems that form the focus of this study, the teachers' views on the future classroom, and the qualifications and needs foreseen are analyzed. The related findings are presented in two tables. In Table 1, the teachers' perceptions of future classrooms are listed, and the qualifications that teachers might need in the future classrooms are given in Table 2. The most highlighted codes are placed from first to the last row under each theme.

Table 1. Teachers' views regarding future classrooms*

Theme	Code	f
Technology	Technological Equipment	7
	Accessible Technology	3
Innovative Teaching Approaches	Learning Spaces	5
	STEM Approach	3
	21st Century-Based Pedagogy	1
	Peripheral Learning	1
	Flipped Learning	1
	Individualized Education	1

Learning Environment	Flexible Learning Environment	6
	Classroom Size	4
	Student-Centered	3
	Classrooms in line with Age, Psychology, etc.	1
	21st Century Pedagogical Classroom	1
	Blackboard	1
	Outdoor Classes	1

*Since the table is long, it is divided into two tables to assure easier reading. The second part is below.

Within the context of teacher perceptions and expectations regarding future classrooms, the teachers' views are collected under six themes. Participating teachers defined their perceptions about future classes on the subthemes: *"Technology, Innovative Teaching Approaches, Learning Environment, School Administration and Function, Teacher Qualifications, and Student Qualifications."*

Regarding the views of the teachers on the theme of *Technology*, it is seen that *"Technological Equipment* and *Accessible Technology*" are mentioned by teacher participants as they foresee future classes fully equipped with technology and assets. The participants claimed that the presence of fully equipped technological equipment is a necessity in future classrooms. The intended equipment from the teacher perspectives varies from an Internet connection and interactive board to robotics education tools. Nesrin stated her opinion: *"A classroom where there are sufficient technological devices for each student and a strong Internet infrastructure; STEM, robotics and coding education could be delivered; there are virtual reality tools and a 3D printer."*

About the theme of *Accessible Technology*, the participants stated that they would like to have technology in classrooms that is accessible to everyone. Semra stated that *"there should be classrooms with assets which make the integration of the technology possible for every student,*" and Duygu stated that the technology and technological tools should be accessible by each student and that disabled students should be taken into consideration, as well.

When the theme of *Innovative Teaching Approaches* was considered, the codes of *"Learning Spaces, STEM Approach, 21st Century Based Pedagogy, Peripheral Learning, Flipped Learning, and Individualized Education"* are seen to emerge. The participants highlighted that *"Learning Spaces*" should be efficiently used in future classrooms. Melisa stated that a future classroom is *"a modern educational understanding where students are in the center; flexible learning spaces are included; group work and collaboration are easily fostered, and peer learning is supported."* Meryem listed the features of the new classrooms under learning spaces: *"We will need classrooms where there is sufficient room for different learning spaces."*

For the *STEM Approach* category, the participants highlighted the importance of the integration of a STEM approach into the courses. Neriman expects *"teachers from multiple and different subjects to deliver integrated courses in a single lecture/course"* in future classrooms.

Regarding the *21st Century Pedagogy* item, Melisa has stated her opinion: *"I would like to see a pedagogy in which the teacher is the guide; the students are more responsible for their learning, and which is prepared with the content supporting the development of 21st-century skills and allows the integration of technology."* For *Peripheral Learning*, Hasan highlighted that peripheral learning should be given a place in future classrooms by *"designing the classroom walls or the ceiling according to the subjects.*" Regarding the *Flipped Learning* item, Semra suggested that it should have a more significant place in the future educational system: *"Trends, such as flipped learning, should be integrated into education by the teachers.*" About *Individualized Education*, Mehmet emphasized individualized learning: *"The subject delivered will be more individualized in future classrooms."*

For the theme of *Learning Environment*, the participants' views are coded as *Flexible Learning Environment, Class Size, Student-Centered, Classroom in line with Age, Psychology, etc., 21st Century-Based Pedagogical Classroom, Blackboard, and Outdoor Classes*. Regarding Flexible Learning, Nesrin stated, *"A classroom supported with flexible learning zones where flexible furniture is supporting both individual and group work of students."* Halise stated her opinion: *"Students should be free in choosing which station they want to work in groups, and classroom design should be like the design of FCL (flexible learning environment) rather than a classical cinema layout.*"

Regarding *Class Size*, the teachers pointed out that there should be fewer students in the future classroom compared to today. Mustafa talked about both equipping classrooms with flexible furniture and the maximum number of the students: *"Within the premise of a flexible learning environment... student seating should be suitable for seen hours…. I would like to see class sizes that do not exceed 25 students.*"

The statements of all the participants about the *Student-Centered* aspect of future classrooms are similar and general; only two participants mentioned the subject directly. Hasan stated, *"It should be completely student-centered, unlike teacher-centered classes today."* About the classrooms in line *with the Age, Psychology, etc.,* Melisa would like to see the classes which need to consider modern educational understanding, students' age, level, and psychology.

Nesrin emphasized the *21st Century Based Pedagogical Classroom* by defining the future classroom as *"a classroom where students feel pedagogically free, and have the opportunity to investigate, inquire, present, and share knowledge.*" Regarding the *Blackboard* and *Outdoor Classes*, one of the participants (Neriman) stated that *"future schools should also have a blackboard in the class and outdoor education in the school garden,*" which implies that teachers want some existing educational features not to be lost for the sake of technology in the future.

Table 1. Teachers' views regarding future classrooms – continued.

Theme	**Code**	**f**
School Administration and Function	Productivity-Based Schools	2
	Equity-Based Schools	1
	Autonomous Schools	1
	Motivating Schools	1
	Collaboration- and Support-Based Schools	1
Teacher Qualifications	Guiding Teacher	4
	Technological and Innovative Teacher	1
Student Qualities	Productive Student	2
	Active Student	1
	Students with 21st-Century Skills	1

Within their expectations about future classrooms, teachers addressed some school features, the role of school administrations, and their functions in the light of technological developments. According to the teachers' views, the roles and functions expected from the future schools are *Productivity, Equity, Autonomy, Motivation, and Collaboration/Support* within the theme of *"School Administration and Function.*"

Regarding the *Productivity-Based School*, Necmiye said that in the future, *"schools will become productivity-based centers, and every school will be themed according to their skills and be more integrated into real life.*" For *Equity-Based Schools*, Mustafa emphasized that in future classrooms, *"there shouldn't be disadvantaged classrooms and discrimination among student types."* Regarding *Autonomous Schools*, Necmiye said: *"Schools will reach a more autonomous structure where they can determine their own rules independent from today's system.*" Free information and free space concepts within the autonomy code are highlighted by three participants as well. Regarding *Motivating Schools,* Semra said, *"Students should go to school not because they have to but because they want to. Classrooms can be equipped in a way that will appeal to students."* Regarding *Collaboration- and Support-Based Schools*, Nesrin mentioned that she expects sharing among teachers and support in future schools: *"In future schools, there should be collaboration and sharing among teachers; administrators should be informed about the innovative developments and inform the teachers."*

For the theme of *Teacher Qualifications*, the participants emphasized teachers' qualifications of the future schools: *Guiding Teacher, Technological/Innovative Teacher.* Regarding the *Guiding Teachers,* Necmiye stated, *"The teacher profile will be based on a guiding role, and it will be one of the authorities to give feedback to students,"* and Hasan supported teachers as guides: *"Teachers will undertake the responsibility of guiding."* Melisa highlighted their guiding role: *"Some of the biggest changes I would like to see in the teachers in future classrooms are contributing to the learning process of more students as a guide and preparing students for a learning environment where they are responsible for their own learning and which helps them investigate, collaborate, interact, produce, and be more confident."*

For *Technological/Innovative Teacher*, Nesrin mentioned, *"A teacher should be improving himself or herself with innovative approaches away from traditional teaching methods, have a command of the technology use, and be in collaboration with colleagues and other education stakeholders."*

Regarding *Student Qualities*, teachers summarized the student profile that they foresee in future classrooms as follows: Productive Student, Active Student, 21st-Century Skilled Student. Hasan also contributed to this code, saying, *"Students will become individuals who produce and realize projects for their own interests and skills*."

About *Active Student*, Duygu drew attention to the active learning roles of students: *"The students who are equipped with information technologies and raised according to the modern system won't hesitate to undertake an active role in the classroom*."

Regarding the *21st Century Skilled Student*, Melisa expressed that she would like to see students with 21st-century skills in the future classrooms: *"The most important aspects that I would like to see in the students in future classrooms are the skills of investigating, thinking, producing, not hesitating to communicate and express themselves, being able to cope with the problems encountered, finding out how and where to get support when necessary, improving themselves with science and scientific methods, and having confidence and vision.*" Actually, 21st-century skills also include being active and productive. Therefore, the researchers placed them under different codes to draw attention to specific skills, which are mentioned by participants separately from 21st-century skills and gave them extra importance.

Table 2. Teacher qualifications and needs for future classrooms

Code	f
Learning of technological contents and applications in education	2
Knowledge of how to integrate technology into classes	2
Knowledge of the use of technological tools	2
Knowledge of innovative teaching methods	2
Knowledge of being able to guide students in the technological age	1
Being able to follow up on the trends (flexible content)	1
Knowledge of delivering a scenario-based course	1

When the participants' needs in future classrooms were questioned, they pointed out that the aspects in Table 2, which they will need most in the future as teachers: *Learning of Technological Contents and Applications in Education, Knowledge of the Integration of Technology into Classes, Knowledge of the Use of Technological Tools/Methods, Knowledge on the Innovative Teaching Methods,* etc.

Regarding *Learning of Technological Contents and Applications in Education*, Semra stated: *"All teachers should learn the terms such as Scratch, Arduino, mBot. They serve as a guide for teachers in the output-based teaching design."* For the term *Knowledge of the Integration of Technology into Classes*, Halise said, *"First, we need to have sufficient pedagogical knowledge. In addition to the knowledge of the use of technological tools, we also need to know how to integrate them into the course."* For the *Knowledge of the Use of Technological Tools* item, Neriman stated her opinion: *"I, as a teacher, need to have a command of each technological tool and know how to introduce and use them in advance."*

Some participants highlighted the necessity of *Knowledge on the Innovative Teaching Methods*. Semra said, *"The teacher who doesn't have adequate knowledge of appropriate teaching methods won't get any benefit, even if he or she has all equipment [and can use it] efficiently. Therefore, teachers should be trained about the new approaches in education and given in-service training."* Meryem and Hasan stated their opinions that classrooms should be fully equipped as well. Other than these needs, the participants mentioned *Knowledge of Guiding Students in the Technology Age*, *Being Able to Follow the Trends*, and *Knowledge of Delivering a Scenario-Based Course*. Halise emphasized that scenario-based education will be prioritized in future classrooms. Duygu stated that the main point in the technological era is the skill of guiding learners to gather information, and Semra expressed that it is of the utmost importance that teachers should first know about the new trends in education. On trends and flexible content, Necmiye addressed the future course content: *"There will be flexible content that can be equivalent to today's needs, rather than standard content."*

Conclusion

Considering the changing needs of the changing world, modern educational institutions should support the acquisition of skills required in the 21st century with innovative applications instead of traditional methods. Schools face an increasing demand for preparing their students for the rapid economic, environmental, and social changes, for jobs yet to exist, technologies yet to be invented, and social issues yet to arise (OECD,

2018). In parallel with the changing student and teacher profile, school and classroom designs must change as well (YEGITEK, 2018). Therefore, it is important to determine teacher perceptions about future classrooms and their design with other related factors, which this study has intended to uncover.

According to the study's findings, teachers' perceptions and expectations about future schools and classrooms are collected under six themes: "Technology, Innovative Teaching Approaches, Learning Environment, School Administration and Function, Teacher Qualifications, and Student Qualities." When the teachers' qualifications and the needs for the future classrooms were analyzed, it is seen that teachers will need the following: *"*learning technological content and its applications in education, the knowledge of technology and education integration, the knowledge of being able to use the technological tools and methods, the knowledge of the innovative teaching methods, the knowledge of trends in education, (such as flexible content), and scenario-based learning.*"*

Instructional technologies and computerized tools have been an integral part of our learning and communication activities (Sahin, Celik, Akturk, & Aydin, 2013, p.110). Likewise, the teachers in the study expect future schools to have technological equipment and all technological tools accessible by students and teachers. Chan (2010) argues that the adoption of technology will be proportional to how much technology is incorporated in the environment and how much it is present. In this context, although the budget plays an essential role in new school designs and structures, technology is expected to be an important component. The study does not present readers with the participants who consider technology solely in relation to the Internet, but also 3D printing, robotics, etc. – the technologies that need to be a part of future classrooms.

When innovative teaching approaches are considered, the teachers in the study foresee an approach that highlights interdisciplinarity and includes the learning zones in future classrooms. When the literature is considered, the concept of learning spaces is brought to the school setting both physically and methodologically. For instance, the six zones in FCL (Ayre, 2017; YEGITEK, 2018) and the learning spaces proposed by Thornburg (2004) have potential. The learning spaces should be supported by an interdisciplinary approach. That is why the participants highlighted the STEM education in this context. What is important in the STEM mentality is to deliver different disciplines in an integrated way (Yildirim, 2018; Yildirim, Basaran, Cucuk, & Yokus, 2018). Modern pedagogy, peripheral learning, flipped learning, and individualized education are presented as possible innovative teaching approaches for the future. The mentioned approaches should be effectively applied in learning zones, as well as in STEM education in future schools.

Students' perceptions of learning spaces vary according to classroom designs and arrangements (Yang, Becerik-Gerber, & Mino, 2013). The most-emphasized point about the learning environment in this study is the flexibility in the future classrooms. Several other studies emphasize that classrooms need to have a flexible furniture system for better education. Pedro et al. (2017) found that schools' heads, teachers, and students all desire more flexible, reconfigurable, and modern classroom layouts, in which technology and active pedagogical practices can be easily incorporated. Kuuskorpi and Gonzalez (2011) define the new dynamic learning spaces: a dynamic space with flexible furniture and context-based methods and supports both individual and group work. According to Neill and Etheridge (2008), contrary to the traditional system, flexible learning spaces provide convenience in the application of innovative teaching methods. Long and Ehrmann (2005) argue that flexibility is the main feature; future classrooms will be flexible in line with the changing educational requirements.

In addition to a flexible learning environment, the participants expect smaller class sizes in the future. In fact, Yildirim (2018) has found class size to be one of the problems faced in the current STEM application, and he highlighted that the number of the students in each classroom should be a minimum of 12 and a maximum of 20 students. While statements include the student-centered aspect of future classrooms and the importance of key factors, such as age, psychology, and seniority, one of the participants emphasized that the chalkboard should be kept, and there should be schoolyard courses. In fact, in his study Lackney (2000) defined the principles of the educational design as being cost-efficient, learner-centered, progressive, and age-appropriate, reliable, comfortable, accessible, flexible, and equity-based. All the conclusions show that participants' perceptions of future school design and a school's learning environment are consistent with the studies in different countries.

One of the study's significant conclusions is that the participants emphasized the school administration and function in future classrooms. The participants observed that future schools should have a productivity- and equality-based, autonomous, and motivating structure. School leaders have important responsibilities in this regard. School leaders can collaboratively establish the structure that will provide both equity and production while exhibiting an autonomous administrative approach in the school. In the new century of information and

digitalization, the production, equity, autonomous systems, and collaborative school structures will manifest themselves in the investments in the teachers and administrators.

Considering the themes of teacher and student characteristics, expectations about the future teacher and students are not actually different from today's expectations. Sheffield, Blackley and Moro (2018) mention the obligation to support and guide students' learning in digital technologies in authentic contexts by contemporary teachers. While constructivism-based education programs have long defined the teacher as a constructor within a guiding role, students are expected to be active learners and producers. Active learning is an approach fostered by constructivism, where students link the old and new information firsthand. As the guide of the process, a teacher guides the students to reach knowledge rather than presenting the knowledge directly (Turksoy & Taslidere, 2016).

Lastly, when teacher qualifications and needs for future classrooms are investigated, it is seen that the participants consider the knowledge of technology and the skill of using technological tools in education as essential for future schools. In fact, today's opinions on the use of digital technologies in teaching show that teachers and students find the use of digital technologies beneficial in education (Sezgin, Erdogan, & Erdogan, 2017).

Although research emphasizes the importance of technology for education, one of the issues that have been discussed is the failure to sufficiently adopt technologies into educational settings, as well as the problems faced in teacher competency for the use of technology (Durak & Seferoglu, 2017). In this regard, participants consider the knowledge of technology integration into courses and the knowledge of technological tools' use as important requirements for teachers as the environments for education change and new educational software are developed, and the main focus shifts to mobile devices, social media, and online learning environments. In this way, teachers need to use technological elements more effectively and gain knowledge in guiding students to become technological leaders in the future.

The participants emphasized two teacher qualifications in future schools as well: being able to follow the trends and delivering scenario-based courses. In fact, the ITEC and FCL projects, of which the Turkish Ministry of National Education is a partner, touched upon these topics with the company of expert educators from European partner countries and included these two topics in their educational transformation plans. For the teachers and leaders who carried out work to enable the class transformation in schools, YEGITEK and the European Schoolnet emphasize the scenario training and the trends within the FCL toolkits (see, http://fcl.eun.org/toolkit).

Lastly, this study has certain limitations, such as a lack of diversity in the data collection tool, which is confined to semi-structured interviews. Furthermore, since the FCL concept and the flexible learning zone approach by the Ministry of Education are new in Turkey, with a few FCL ambassadors and teachers competent on the concept, just a limited number of participants from several cities could be included in the research process. In this regard, a more comprehensive study can make a significant contribution to the literature as the FCL concept and flexible learning zones approach get more recognition in all regions.

A Framework for Future Classroom According to the Conclusions

The themes in Tables 1 and 2 appear when the codes are systematically compared upon the analysis of the foreseen future classes and teacher characteristics expressed by the participants. To sum up the conclusions, in line with the literature, the participants foresee the future classroom or school as *"a system which is equipped with technological equipment, provides the new teaching methods required by the age, is created according to the flexible learning environment design, has the production, equity, autonomy, motivation, and collaboration in the school management approach, has teachers as guide and students as active and productive individuals."*

When the teacher needs and qualifications about future classrooms were investigated within their guiding role, the skills, knowledge, and qualifications that teachers will need most in the future classrooms are listed as follows: *~~l~~learning of technological contents and applications in education, the knowledge of the integration of technology in classes, the knowledge of using technological tools, the knowledge of the innovative teaching methods, and the knowledge of trend and scenario-based learning."* Teachers will be guides — informed with technology and innovative qualities and will be able to follow flexible content and modern teaching tools. Based on these codes, as seen in Figure 3, the relationship between the teachers, school, and students in the future can be seen. This observation explains the expected context for future classes.

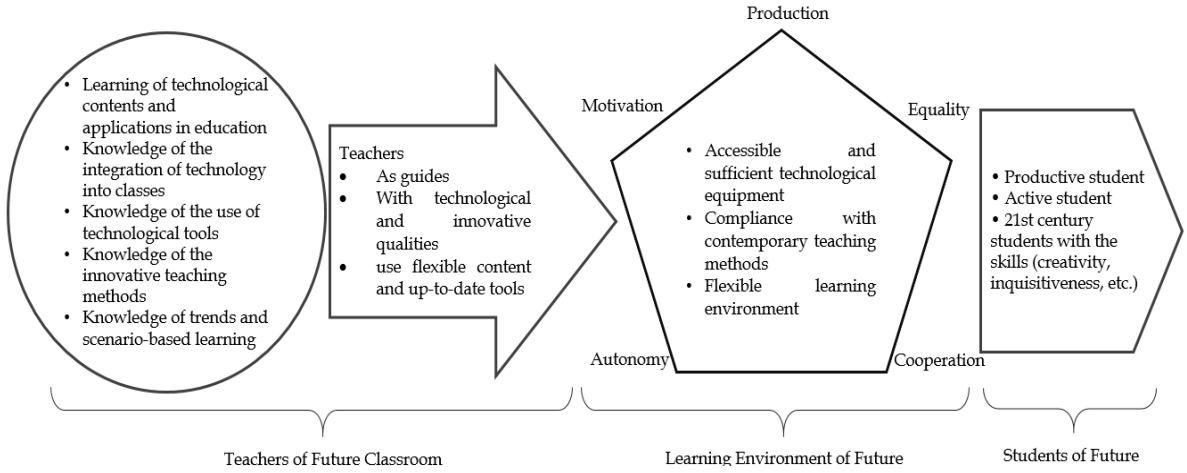

Figure 3. The future classroom and its precursors based on teacher opinions

In this study, the future classroom expresses the innovative educational and learning environment that schools need to build in the near future. The model, on the other hand, refers to a multidimensional structure that will serve future classes in a broader framework. That is why, it is not enough to equip classes with only technology and flexible learning areas to support the development of future classes. Instead, in an ideal future school system, the logic of production, equality, and innovation should be established. Students should be educated within current trends, including scenario-based learning, and teachers should be empowered with technological education and flexible lesson processing skills through undergraduate education or professional development training. A class with these features is certainly needed in future schools. When Figure 3 is interpreted, the desired teachers and characteristics of the learning environment are seen to reinforce the structure and functions of schools. These features, in turn, will lead to the formation of the target student profile needed to meet the needs of students in the 21st century and beyond.

In conclusion, these findings suggest that the new century's schools – in line with technological developments – need (a) technologically competent school managers and teachers (i.e., technology leaders), (b) flexible classroom designs with complementary technological and physical infrastructure to give students a more effective way to learn, and (c) a more cooperative, autonomous, motivating, egalitarian, and productive educational atmosphere. In this regard, researchers are recommended to focus on studies that investigate the integration of modern educational environments, approaches and leadership qualities (such as FCL, project-based, or flipped learning, technology leadership, etc.), and programs that make use of the tools and opportunities this century presents. Policy makers, on the other hand, should drive change in the traditional school with contemporary education paradigms to better equip the world's next generations of students under flexible, technological and innovative school leadership.

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