The Implementation of Blended Synchronous Learning and Its Effects in Kazakhstan

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***Abstract*—Kazakhstani universities actively implement Blended Synchronous Learning (BSL) to provide flexible learning opportunities. This study examines current BSL practices in Kazakhstan's Higher Education Institutions (HEIs) and the challenges hindering their effectiveness. The research employed an observational approach with experimental BSL classrooms at Almaty Management University and Abai Kazakh National Pedagogical University, alongside structured interviews with selected students and teachers. Data collection involved classroom recordings, teacher observations, and interview transcriptions using software and manual methods. Findings indicate that while some universities have adopted BSL, most HEIs are still in the implementation phase. The most common BSL practice is video conferencing via Zoom and MS Teams. Students reported high satisfaction, improved interactions, and greater accessibility. However, effective BSL requires enhanced student self-organization and additional teacher preparation, high quality infrastructure. In conclusion, BSL offers flexibility, availability, and accessibility, yet challenges remain, particularly in infrastructure, technical support, and teacher training. Future research should explore BSL's impact on student performance, instructional methods, and the technical and psychological aspects of this learning model.**

***Keywords*—blended synchronous learning, synchromodal classes, synchromodal learning, higher education system, higher education institutions**

I. Introduction

Blended Synchronous Learning (BSL) as a concept represents the theoretical foundation of an educational framework that integrates traditional face-to-face and real-time distance learning. It is not merely a method or technology but a holistic approach aimed at creating a flexible and inclusive learning environment. BSL involves conducting lessons where some students are physically present in the classroom, while others join remotely, participating in the same sessions simultaneously via digital platforms. According to the definition, BSL refers to "real-time learning sessions that integrate in-person and remote learners into the same educational processes" [1, 2].

As noted by Bauer et al., BSL describes a set of practices utilizing technologies such as videoconferencing, web conferencing, and virtual environments to facilitate collaborative learning among students, regardless of their location [3]. The concept spans various contexts, enabling the integration of remote participants into classroom interactions while maintaining synchronicity. This understanding of BSL highlights its uniqueness: it is not merely a hybrid format but a system where real-time engagement and collaboration become key elements of the educational experience.

BSL is grounded in several key theories, including connectivism, which emphasizes the importance of networked learning [4], sociocultural theory [5], which views learning as occurring through interaction with others, and cognitive load theory [6], which focuses on optimizing information delivery. Additionally, BSL considers social presence theory [7], which influences the quality of interaction in blended environments, and flexible learning theory [8], which allows for the adaptation of educational processes to students' needs. These theoretical foundations enable BSL to effectively combine online and face-to-face learning, fostering an accessible and interactive educational environment.

BSL as a concept effectively expands access to education and enhances student engagement by combining real-time feedback from in-person audiences with the active contributions of online participants [9]. This approach enables remote students to attend lectures via videoconferencing while simultaneously providing online access to course materials [10], ensuring flexibility and supporting the achievement of educational goals [11]. BSL has proven its effectiveness in higher education (HE) across various contexts [12, 13]. Studies conducted in the USA, Asia, and Europe have identified improvements in student performance and satisfaction with the implementation of BSL [14, 15].

For example, the BSL model implemented at Pennsylvania State University, USA, allowed students to choose between attending in person or participating remotely without compromising the quality of support [16]. Similarly, the Open University of the Netherlands successfully applied BSL to create flexible schedules and improve accessibility for working students [17]. This approach not only strengthens collaboration among participants but also adapts to individual learning needs, making BSL a valuable tool for modern educational practices [18].

Recent research on BSL highlights both the opportunities and challenges associated with this model [19, 20]. However,

most studies focus on specific cases and disciplinary aspects of BSL, with few systemic analyses, such as that by Bower et al. [3]. The strategic potential and scalability of BSL remain underexplored, indicating a need for further research to ensure effective support for BSL as an innovative pedagogy on a larger scale and within academic development. Key questions include: (a) BSL's interaction with other educational approaches, (b) the adaptation of professional development programs to different experience levels and teaching styles, (c) BSL's impact beyond specially equipped learning spaces, and (d) its effects on faculty professional development. The relevance and sustainable integration of BSL into teaching practices depend on addressing these issues, shaping its future as a significant element of the educational ecosystem [21].

The implementation of BSL in Kazakhstan reflects the country's efforts to raise awareness of digital tools used in higher education and make them more accessible [22]. Kazakhstan universities, such as Nazarbayev University and Al-Farabi Kazakh National University, have adopted BSL to support distance learning and enhance student communication [23, 24]. Among the tools used by faculty and students in Kazakhstan's universities, Zoom and Microsoft Teams have been widely utilized by students to connect to BSL environments [25].

Kazakhstan studies have confirmed the effectiveness of Blended Synchronous Learning (BSL) and its active application in the country's universities. However, they have also highlighted a lack of focus on analyzing current practices and the challenges arising from their implementation [26, 27]. This presents an opportunity to explore the state of BSL and its related challenges within the country's higher education system.

Thus, this study aims to conduct an in-depth analysis of existing BSL practices in Kazakhstan universities and identify the difficulties associated with their implementation to expand the understanding of this model in a local context. This has led to the formulation of the following research questions:

1) What BSL practices are currently used by universities in Kazakhstan?
2) What challenges do Kazakhstani universities face in providing BSL?

II. Literature Review

The concept does not have a single "founder" but is associated with the work of key researchers in educational technology. Charles R. Graham laid the theoretical foundation for blended learning in his book Handbook of Blended Learning (2006) [28], where authors from various countries (Australia, Korea, Malaysia, the United Kingdom, Canada, and South Africa) examined blended learning (BL) from an institutional perspective, emphasizing the flexibility of approaches. Anthony G. Picciano, in Blended Learning: Research Perspectives (2007), explored the integration of synchronous and asynchronous elements, which influenced the development of BSL [29]. A more specific contribution came from Australian researchers Bower, M., et al., who published Blended Synchronous Learning: A Handbook for Educators in 2011 [30]. They systematized the approach, proposing strategies and tools (Zoom, WebEx) for simultaneous instruction of both in-person and remote students, clarifying the differences between hybrid and synchronous learning. BSL evolved in the 2000s alongside advancements in video communication technologies, building upon early experiments in distance education.

A. Foreign Practice of BSL

The use of BSL has been evident in most universities across different parts of the world. In North America, particularly in the USA and Canada, BSL has been implemented in many universities, improving both student learning experiences and accessibility [31, 32]. At the University of Central Florida, BSL was adopted to connect students attending in-person classes with those studying online through synchronous classrooms [33]. Additionally, BSL has been integrated into British universities, ~~at~~ the University of Edinburgh and the University of Manchester [34, 35]. Existing research on British universities confirms that BSL not only supported uninterrupted learning but also played a role in improving accessibility and diversity within higher education institutions in the country [36]. Moreover, Asian countries have also utilized BSL for various purposes. In Japan, BSL was applied to meet diverse student needs and foster consistent interactions through virtual learning environments [37]. In South Korea, BSL was introduced to address challenges associated with large class sizes and to promote personalized learning [38]. In Africa, BSL has been used to expand educational opportunities in remote and rural areas [39]. For example, in Uganda, BSL was implemented to enhance learning in universities with limited classroom space and to support students with disabilities [40]. Makerere University actively adopted BSL, integrating mobile technologies and low-bandwidth solutions to facilitate its deployment [41]. Furthermore, Australian and New Zealand universities have adapted to BSL due to the high number of distance-learning students [42]. The University of Sydney and the University of Auckland developed high-quality BSL models that incorporate both synchronous and asynchronous learning (courses delivered at different times) to support students' academic efforts. Thus, in the aforementioned geographic regions, several key ideas and trends related to BSL can be identified, supported by previous research. First, the effectiveness of BSL directly depends on the level of technological support and the familiarity of students and university faculty with digital learning technologies [43]. Second, professional development and training play a crucial role in ensuring the proper use of BSL technologies and approaches [44, 45]. Third, BSL remains flexible in accommodating different types of learners, their preferences, and their schedules. Additionally, the COVID-19 pandemic served as a major driver of BSL adoption worldwide [46, 47]. The use of BSL varies across different regions:

- In North America and the United Kingdom, it enhances accessibility and inclusivity.
- In Australia and New Zealand, it supports distance learning.
- In Asia, it addresses personalization challenges and overcrowded classrooms.
- In Africa, it expands education in remote areas.

The effectiveness of BSL depends on technology, faculty training, and the flexibility of the approach. The COVID-19 pandemic accelerated its global adoption, highlighting

regional differences in adaptation.

B. Current Practices of BSL in Kazakhstan

The BSL approach is gradually being integrated into Kazakhstan's higher education system as part of ongoing educational reforms [48]. Interaction between faculty and students in Kazakhstan universities relies on specialized tools such as LMS platforms (Moodle, Canvas), cloud-based services (Google Drive, Yandex Cloud, Dropbox), and corporate solutions like MS Teams [49]. Additionally, many universities actively use messaging apps such as Slack, Telegram, and WhatsApp for student communication, alongside email, which serves as an additional channel in learning management systems [50].

The practical application of BSL in Kazakhstan universities can be divided into two main approaches:

1) Limited learning formats, where the mode of instruction is determined by university policies, curricula, epidemiological conditions, and faculty status [48]. Here, BSL acts as an intermediate link between traditional face-to-face and fully online learning (Abai Kazakh National Pedagogical University and Al-Farabi Kazakh National University) [23, 24].
2) Flexible participation models, where students can freely choose between in-person and remote learning, positioning BSL as a universal and adaptive model that meets individual student needs and preferences [25] (Eurasian Technological University and Almaty Technological University, among others).

C. Challenges and Strategies of Blended Synchronous Learning (BSL) in Enhancing Higher Education

Recent Kazakhstan's research on BSL has focused on bridging the digital divide and ensuring equal access to higher education by allowing remote students to participate equally with face-to-face students [1, 20–21, 50]. This approach promotes collaboration, integrates advanced technologies, and prepares students for hybrid work environments [51]. However, BSL faces a number of challenges [52]:

One of the key challenges is the uneven distribution of digital resources across regions. Universities in large cities of Kazakhstan are generally provided with high-speed internet and modern technology, while in rural areas, access to such resources remains limited [26]. This hinders the full participation of remote students in synchronous classes and reduces the overall effectiveness of BSL.

Many universities lack the necessary equipment to support BSL in classrooms. In such conditions, it becomes impossible for remote students to participate in a high-quality manner on par with face-to-face students, which contradicts the very essence of the BSL model [50].

The low level of digital competence among both teachers and students limits the possibilities of using BSL [25]. Educational programs in Kazakhstan universities do not yet provide for sufficient training of teachers in the use of BSL [24].

The current higher education system in Kazakhstan is focused primarily on face-to-face and e-learning. BSL requires a revision of established approaches, which causes institutional resistance to change [25]. In addition, regulatory restrictions also hinder the spread of BSL: to date, only one university - Satbayev University - has an official license to implement educational programs entirely online as part of a pilot project of the Ministry of Higher Education of the Republic of Kazakhstan. In other cases, universities only have access to a hybrid format, primarily in graduate and post-secondary programs [https://satbayev.university/en].

Universities lack strategies and practices to ensure sustainable implementation of BSL. Insufficient methodological support, a weak technical base, and limited student engagement in the digital environment limit the potential of BSL [50].

Successful implementation of BSL requires a problem-solving strategy, a comprehensive approach that includes:

- A comprehensive approach is needed to successfully implement BSL, including:
- Developing digital infrastructure in rural and remote areas;
- Professional development of teachers focused on mastering digital pedagogy;
- Integrating innovative tools such as AI-based chatbots [53];
- Using active learning methods, including problem-based learning and peer-to-peer approaches [25, 27, 51];
- Using formative online assessment as a means of increasing student motivation and engagement [50];
- Developing international cooperation and sharing best practices;
- Creating flexible learning formats, especially in technical and engineering disciplines;
- Creating a flexible, personalized and resource-oriented educational environment that encourages students to be independent in setting goals, choosing learning paths and assessing results;
- Developing international cooperation and sharing best practices.

The COVID-19 pandemic has demonstrated the importance of flexible educational models and accelerated the adoption of BSL, confirming its relevance in the context of uncertainty [48, 54].

Thus, the systematic implementation of BSL requires overcoming technological, methodological and organizational barriers. The authors of the article consider this analysis as a basis for further research aimed at developing effective BSL models and adapting higher education to digital transformation

III. Materials and Methods

A. Research Design

The research design incorporated a mixed-method approach, combining observational studies and structured interviews, in which faculty members from various disciplines at two universities—Almaty Management University (Almaty, Kazakhstan) and Abai Kazakh National Pedagogical University (Almaty, Kazakhstan)—conducted experimental classes equipped with BSL technologies over a period of three months.

Student training was conducted based on the four hybrid (synchronous) learning models proposed by Bell (2014):

"Connected Classes," "Shared Portal," "Personal Portals," and "Small Groups" [55].

- The "Connected Classes" model involves linking multiple classrooms via video conferencing to enable synchronous interaction between students from different locations (Fig. 1) [55].
- The "Shared Portal" model is focused on distance learning through a digital platform, where students independently engage with course materials.
- The "Personal Portals" model provides individual access to learning resources and personalized feedback, fostering adaptive learning.
- The "Small Groups" model emphasizes team-based learning in small groups, combining face-to-face and online formats, requiring active instructor involvement in coordinating the process.

Each model offers a unique approach to organizing hybrid learning, addressing the diverse needs of both students and instructors. Classroom equipment, learning content, and software were aligned with each model to ensure effective implementation.

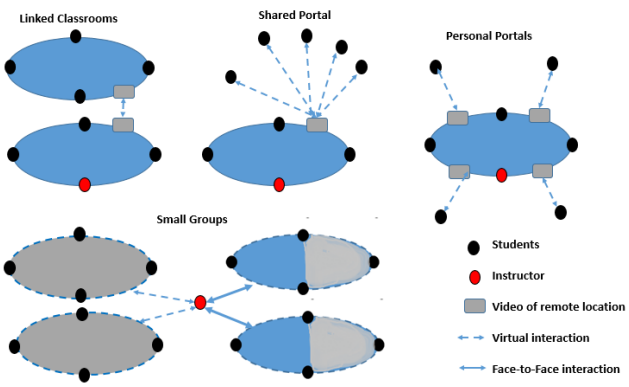

Fig. 1. Synchromodal models topography summary.

Additionally, the research design was based on a qualitative study, which included interviews with both open-ended and closed-ended questions. This approach allowed for comprehensive feedback on the perception and effectiveness of model's BSL technology in the learning process.

B. Data Collection

The data collection technique used for the observational research design was direct observation of experimental classes provided with model's BSL technologies for three months. The equipment used to implement BSL technology include panoramic video cameras, a ceiling microphone array, acoustic speakers, a screen showing remote students, a marker board with camera, teacher's workstation with a panel for switching lesson scenarios, teacher's laptop and an interactive whiteboard. Connecting remote students was carried out through the Microsoft Teams space. When conducting classes in a BSL format in these classrooms, the teachers could see and converse to all students, enter into dialogue with them, move freely throughout the entire classroom, demonstrate any materials available to all students, call any student to the board, and provide the necessary requirements to ensure hassle-free teaching sessions. During the observations, key aspects of teacher-student interaction, the effectiveness of technology usage, and its impact on the educational process were documented.

Another form of data collection techniques used for this research were recorded interviews. During the interviews, cameras were used to record the sessions and the participants' responses were obtained in written form using a combination of transcription software and manual transcription. The interview process consisted of several stages:

1) Preparation Stage—This involved developing a list of questions that included both Open-Ended Interview and Closed-Ended Interview, aimed at identifying teaching and learning experiences with BSL.
2) Interview Stage—Interviews were conducted both individually and in group settings. Each session lasted between 30 to 60 minutes. Recordings were made with participants' consent, and key points were also documented manually.
3) Transcription Stage—Automatic transcription software was used for initial data processing, followed by manual verification and adjustments to ensure accuracy.
4) Data Coding Stage—After transcription, participants' responses were categorized by key research themes, allowing for the identification of main patterns and differences in the perception of BSL technologies.

C. Population and Sampling

The observational study involved 40 respondents formed into target focus groups: 15 teachers, 3 specialists from the university IT department, including a manager responsible for equipping the IT infrastructure, and two technical specialists ensuring the smooth operation of digital platforms. Two employees from the online education department were involved: an instructional designer and a producer. The student sample consisted of 20 people, equally divided between online and offline learning formats, with all students having experience of both formats of the educational process.

Faculty and students from Almaty Management University and Abai Kazakh National Pedagogical University were the participants of the study.

D. Data Analysis

The study is based on qualitative content analysis, which includes the systematization and interpretation of data. During the analysis, key categories were identified, forming the structure for presenting the results. The data were organized in tabular form for clarity and ease of interpretation, allowing for the identification of main trends and interrelations.

1) Observational data analysis

Notes were taken systematically in the data collection process to analyze how students and instructors engaged and used model's BSL technologies in the classrooms. The interactions that were observed alongside the teaching, learning and use of BSL tools were analysed through photo-documentation where the researcher captured photographs during the classes to support the analysis. The different observational findings obtained from the teaching sessions were summarized in the form of descriptive texts using the data collected from the videotaping of the teaching practice sessions.

2) Interview data analysis

These comprised interview responses that were obtained and transcribed to evaluate all the sufficient information gathered as required. The interview responses were grouped systematically in tables focusing on different aspects of the study. The findings from the tables were explained in terms of the interviews' key points. The analysis of interview results was conducted sequentially:

- Primary analysis: Transcribed interviews were checked for completeness and accuracy, and key semantic blocks were identified.
- Data coding: Participants' responses were classified into thematic categories, such as *"Recommendation", "Technology" and "Methodology"*.
- Grouping of results: Analytical tables were created based on coding to record key trends and differences in respondents' answers.
- Interpretation: Interview results were compared with observational data to identify patterns, consistencies, and contradictions.

3) Validity

To minimize the threat to the validity of the research, findings from the class observations and interviews were compared for verification. Member checking was done by taking the interview transcripts and the initial analysis results back to the participants to ensure the validity of the recorded data and the conclusions made.

Moreover, from all participants, prior informed consent was sought and the confidentiality of the study was observed at all times. The interview participants were assured that their answers would be kept confidential and used for research purpose only.

IV. Result and Discussion

A. Observational Results

Based on the results of the first part of the study that involved an observation study conducted in experimental classes equipped with BSL technologies for three months, the students in the audience had the opportunity to see and listen to the reactions of remote students, entered into dialogue with them, and learned together (shown in Figs. 2–3).

Fig. 2. BSL audience (shared portal)

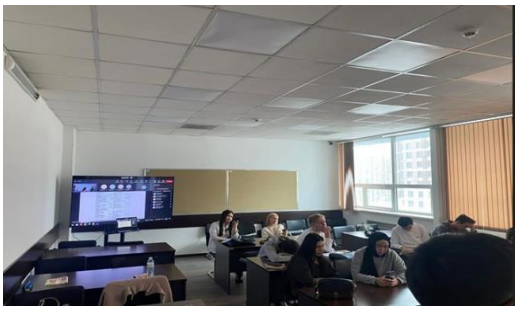

Fig. 3. Second monitor in a BSL classroom.

The Table 1 presents a comparative analysis of different Blended Synchronous Learning (BSL) models, highlighting their advantages and disadvantages from the perspective of instructors. Studies have demonstrated that students learning remotely successfully communicated with those in the classroom, actively participated in discussions, asked questions, and felt like full participants in the learning process.

Table 1. Advantages and disadvantages of BSL, according to teaching staff

Advantages	Disadvantages
Models of BSL Developed: Linked Classroom Model	
Provides flexibility and choice for students. Students have the opportunity to communicate with other students and the teacher in real time. Teachers can track students' progress and provide support.	Requires hardware and software to conduct classes in real time. It can be difficult to manage a classroom with students in different locations.
Models of BSL Developed: Shared Portal Model	
Provides students with access to learning materials and resources anytime, anywhere. Allows students to learn at their own pace. Can be a cost-effective option for universities.	It can be difficult to motivate students to learn on their own. It can be difficult to ensure interaction between students and the teacher.
Models of BSL Developed: Personal Portal Model	
Provides a personalized learning experience for each student. Allows students to receive feedback from the teacher in real time. Can promote critical thinking and problem solving skills.	Requires significant effort from teachers to develop and implement personalized curricula. It can be difficult to track each student's progress.
Models of BSL Developed: Small Groups Model	
Allows students to receive more attention from the teacher. Encourages active participation of students in the learning process. Can help develop collaboration and teamwork skills.	Requires significant efforts from teachers to organize and conduct classes in small groups. It can be difficult to ensure a diversity of opinions and perspectives in small groups.

Teachers noted that audio quality played a crucial role, as it ensured equal content delivery to all participants, regardless of their location. It also significantly facilitated the conduction of online sessions. BSL models enhance flexibility and accessibility in the educational process:

- The Linked Classroom Model fosters real-time interactive engagement between students and teachers but requires significant technical resources and organizational efforts.
- The Shared Portal Model provides students with convenient access to learning materials but may hinder their motivation and interaction with instructors.
- The Personal Portal Model offers a personalized learning approach and opportunities for individual feedback; however, it demands considerable effort from teachers to develop tailored learning programs.
- The Small Groups Model promotes closer interaction between students and instructors and strengthens teamwork skills, but it presents additional challenges in organizing sessions and ensuring diverse perspectives.

Overall, according to teachers, the choice of the optimal BSL model depends on course objectives, students' level of independence, and available resources. Each model has its strengths and weaknesses, and their combination can enhance the effectiveness of the educational process.

Thus, the choice of a BSL learning model depends on the specific needs of the university and students. The 'Linked Classroom' may be a good choice for institutions that want to provide flexibility and choice for students, as well as the ability for students to interact with the instructor in real time. A 'Shared Portal' can be useful in providing students with access to learning materials and resources anytime, anywhere, and saving money. The 'Personal Portal' can provide a personalized learning experience for each student and promote the development of critical thinking and problem-solving skills. 'Small groups' are useful in providing students with more attention from the teacher and encouraging active student participation in the learning process.

For the BSL brainstorming sessions, the participants were divided into groups (Table 2). Each group included teachers, online and offline students, and an IT specialist. Thus, Group 1–5 teachers, 6 students, 1 IT staff, 1 online education staff (Focus–The Instructor's Path) discussed the essential skills, technologies, and teaching methods required for BSL. Group 2–5 teachers, 7 students, 1 IT staff, 1 online education staff (Focus–The Online Student's Path) examined the requirements for online learning, necessary tools, and effective learning and teaching strategies. Group 3–5 teachers, 7 students, 1 IT staff (Focus–The Offline Student's Path) analyzed the learning conditions for offline students, support mechanisms, and their adaptation to BSL models (Figs. 4, 5).

Fig. 4 presents the outcomes of the brainstorming session, while Fig. 5 illustrates the discussion process within the brainstorming groups.

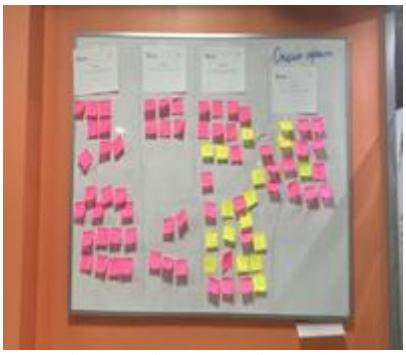

Fig. 4. Brainstorm session results.

Fig. 5. Group discussions.

According to the rules of the brainstorm session, it took place in three steps. In the first step, participants explored questions, came up with ideas, and wrote them down. In the second step, 'Discussion and voting,' participants selected important and popular ideas among the proposed ideas and marked them with stickers. The third step included presentations to all participants of methodological recommendations from groups for all categories of participants in BSL.

Table 2. Information about groups: goals and questions for discussion

Group	Group 1 - The path of a teacher	Group 2 – The Online Student Path	Group 3 – The offline student's path
The purpose of the work	Recommendations for teachers working in a BSL format	Recommendations for online students studying in a BSL format	Recommendations for offline students studying in a BSL format
Issues for discussion	- skills and knowledge required by teachers; - technologies, tools and resources to support BSL teaching; - effective methods and techniques of teaching in a BSL format.	- requirements for online students; - tools and resources to support online students; - effective strategies for teaching online students in a BSL format.	- required for offline students; - tools and resources to support offline students; - effective strategies for teaching offline students in a BSL format.

1st group - the path of teachers;
2nd group - the path of an online student;
3rd group - the path of an offline student.

As a result of the brainstorming session, methodological guidelines were developed for teachers, on designing a pedagogical scenario for conducting BSL classes (syllabus, e-UMCD of the course), as well as guides for both online and offline students.

Table 3 provides a detailed description of the roles and

actions of participants in the BSL process. It outlines the responsibilities and interactions of teachers, online students, and offline students at different stages of the lesson: before starts, at the beginning of the class, in the middle of the class, at the end of the class, and after the class.

This table helps to:

- Systematize the learning process—identifying key lesson stages and determining the tasks of teachers, and students at each phase.
- Compare learning formats and model's BSL—highlighting the differences between online and offline student activities, describing their common and specific responsibilities.
- Assess teacher workload and functions—covering aspects such as preparation, knowledge assessment, classroom management, and providing feedback.
- Emphasize the role of technology—particularly in online learning, where technical readiness and digital tools are essential for effective interaction.

Table 3. Roles and actions of participants in BSL learning

Lesson Stages / Participants	Roles/ Activities: Teacher	Roles/ Activities: Online student	Roles/ Activities: Offline student
Before class starts	Preparation for the lesson: - studying the curriculum, preparing materials, checking the readiness of the audience and equipment to the selected model's BSL; - sending information about the format of classes to students (schedule, assignments, links to educational materials); - preparation for working with online students (conducting instructions on the use of technology, developing tasks and exercises for online completion); - preparation for working with offline students (instructing on the use of technology for group/pair work, including online, developing tasks and exercises for offline implementation).	Prepare for the lesson: study the curriculum, review educational materials, prepare questions and comments. Familiarize yourself with the technical requirements.	Preparation for the lesson: studying the curriculum, completing assignments, preparing questions and comments.
At the beginning of the class	Greeting students. Conduct and summarize the results of preliminary diagnostics of students' knowledge. Discussion of the goals and objectives of the lesson.	Connecting to the lesson, greeting the teacher and students; - adding comments to the chat or work area.	Arrival to class, greeting the teacher and students.
In the middle of class	Explain the goals and objectives of the lesson. Distribute roles and responsibilities. Provide feedback. Manage the learning process / explanation of educational material, completion of tasks and exercises, answering questions /. Organize interaction with students in face-to-face and online formats (in a small group, individually, frontally).	Watch a presentation or video, actively participate in discussions, perform exercises, answer questions. Think about the lesson material. Work in groups or individually	Participating in discussions, doing exercises, answering questions. Work in groups or individually
At the end of the class	Summarize the lesson, assign homework Analyze the results of the lesson.	Recording homework, answering teacher questions.	Recording homework, answering teacher questions.
After class	Checking homework, preparing for the next lesson.	Prepare homework, preparation for the next lesson.	Prepare homework, preparation for the next lesson.

B. Interview Results

For the second part of the research design that comprised interviews, among those interviewed, only 15% of interviewees noted that they used the BSL format before the pandemic during the COVID-19 restrictions. The main experience of BSL was gained during the pandemic, when the universities transferred almost the entire educational process first to a distance learning process (online) and then to a BSL format (part in person, part online). However, all teachers (100% of the teacher interviewees) had experience teaching classes in distance learning, while only some were well-versed in BSL format (25% of the teacher interviewees) at the time of the interview. Also, all student interviewees had experience with distance learning and half of the student interviewees were familiar with BSL learning. All participants are experienced users of learning management systems, digital learning tools and conferencing platforms such as Zoom or Google Meet, and MS Teams.

Many of the student interviewees had attended both the role of a full-time and a remote participant during their study lessons. In their opinions, with stable operation of technology and the Internet connection during practical classes held in BSL environments, live presence in class and a remote connection with the classroom holds similarities.

1) Responses to open-ended interview questions

The open-ended interview questions assessed the degree of convenience and comfort, student involvement, preparation for class, and many other aspects. It included many questions in different areas of work.

Here are some of them:

1) Assess the possibility and effectiveness of

communication between face-to-face and "distance" students during class.
2) Evaluate the benefit of being able to see the faces of "distance" students during class.
3) Assess whether you can act comfortably (naturally, walk and talk without thinking about whether "distance" students can hear you and how to face the microphone and camera) in a BSL classroom.
4) Assess how effectively feedback is provided to students attending classes remotely.
5) Assess the role of teachers and students in BSL learning?
6) What would you recommend to your colleagues for implementing BSL?
7) What technology solutions do you consider necessary for the successful implementation of BSL learning?
8) What changes to course materials and teaching methods need to be made to ensure effective delivery in the BSL format?

Tables 4 and 5 present summarized responses from respondents - both teachers, and students—to open-ended interview questions regarding the implementation of BSL. Table 4 provides a comparative analysis of key aspects, while Table 5 focuses on necessary changes in education. These tables structure the perspectives of educational process participants around three main aspects: recommendations for BSL implementation, required technological solutions, and changes in teaching materials and instructional methods.

Teachers emphasize the importance of preparation, the use of modern technologies, and accounting for additional time investments, whereas students highlight the need for active participation and a greater sense of responsibility in this learning format. Regarding technological solutions, both groups agree that successful BSL implementation requires high-quality video communication, efficient content management, and collaboration tools.

When it comes to changes in teaching materials and instructional methods, both teachers, and students recognize the significance of interactive materials, group work, and discussions. Additionally, teachers, emphasize the necessity of flexible lesson planning to adapt to the hybrid nature of BSL.

The study focuses on the implementation and development of BSL in Kazakhstani universities. Therefore, the data presented in the table help identify the main challenges and recommendations for organizing BSL from the perspectives of both kazakhstan teachers, and students. They also allow for the determination of key technological requirements that must be considered when designing the educational environment, as well as the analysis of necessary changes in teaching methods for a successful transition to the BSL format.

Thus, the Table 4 provides empirical data that can be used to substantiate the study's conclusions, develop recommendations, and propose improvements for BSL.

Table 4. Comparative analysis of interview responses by aspects

Aspect	Question	Instructors	Students
Recommendations	What would you recommend to colleagues for implementing BSL?	Plan lessons carefully, use technology, be prepared for challenges.	Actively participate, be ready for independence.
Technology	What technological solutions are necessary?	Video communication, content management, interaction.	Video communication, tools for collaboration.
Methodology	What changes in materials and methods are needed?	Interactivity, group work, flexibility.	Interactivity, group work.

Table 5. Summary of key changes in BSL implementation

Category of Change	Key Aspects (Instructors)	Key Aspects (Students)
Preparation for BSL	Thorough preparation and consideration of time resources for effective implementation.	Developing students' readiness for independent work and increasing responsibility.
Technology for BSL	Implementation of high-quality video communication, convenient content management, and interaction tools.	Creating user-friendly platforms for collaboration, simplifying communication and coordination.
Methodological Changes in BSL	Use of interactive materials, active implementation of group work formats.	Adapting the learning process to participants' needs through flexible ~~lesson~~ planning.

One of the interviewees said: "I believe that BSL learning has great potential for increasing the efficiency and flexibility of education. It allows students to access educational resources and interact with teachers at a place and time convenient for them."

This led to the conclusion that training in a BSL classroom makes the work of all participants in the educational process more comfortable, increases motivation, and raises engagement to a higher level. The experience of students in the classroom and those who connect from outside is almost the same, and the teaching experience is more intense (time spent preparing for classes, high workload for the teacher during the class) compared to the online mode. Teachers also noted that BSL learning requires additional preparation from students, who must be ready for independent work and self-organization. However, a number of interviewees illustrated with examples the limitations of the BSL format, which can negatively affect the quality of education. The most common limitation identified was that BSL is not suitable for all subject areas (e.g. laboratory, studio classes).

2) Responses to closed-ended interview questions

To analyze the results of closed-ended interview questions concerning the satisfaction of students in BSL learning, the average of the responses for each question was calculated. The numerical results are presented in Table 6.

Table 6. Assessment of satisfaction of participants in BSL learning

Statements/Responses	Score[1]
1. I believe that BSL learning allows me to learn at a pace and format that suits me.	4,5
2. I believe that BSL learning makes education more accessible to me.	4,3
3. I believe that BSL learning allows me to receive personalized learning tailored to my individual needs.	4,2
4. I believe that BSL learning requires me to be quite self-organized.	3,9
5. I believe that BSL learning allows me to interact effectively with teachers and other students.	4,4
Average	**4,26**

[1] from 5 – fully satisfied; to 1 – not satisfied

The mean values for each of the questions above 4.0 indicate a high level of satisfaction among respondents, mean values between 2.5 and 4.0 indicate an average level of satisfaction, and mean values below 2.5 indicate a low level of satisfaction. Overall, students are satisfied with BSL. The average score for all questions is 4.26, which means that students are satisfied to a large extent.

For the questions 1–5 given in Table 6, Fig. 6 shows the number of students and teachers who were 'fully' satisfied with each question.

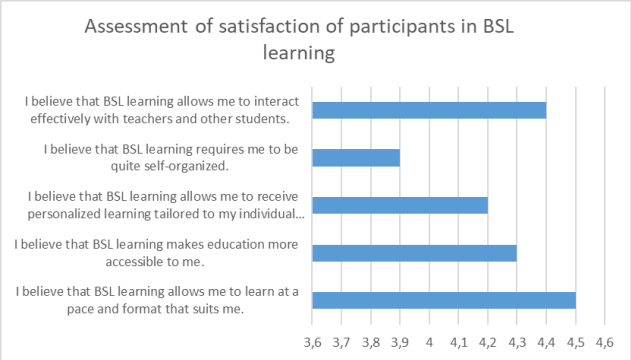

Fig. 6. Closed-ended questions' results.

This study deepens the discussion on BSL implementation by offering new data obtained in the context of Kazakhstani universities. The obtained results not only confirm a number of findings of previous studies, but also reveal specific features associated with the local educational context, which allows us to expand our understanding of BSL implementation in developing countries, which have not been previously considered in international studies.

We will consider the results of the analysis of conformity, contradictions and extensions of previous studies in two aspects proposed in the study: technology, methodology with recommendations.

- Technological infrastructure

As in earlier works [10, 34], the key factor for the successful implementation of BSL was the technological infrastructure. In particular, high quality audio and video transmission [43] plays a crucial role in ensuring effective interaction between face-to-face and remote students. The challenges of implementing BSL in universities in Kazakhstan, such as the need to have appropriate equipment and equip them with BSL technologies, reinforce the findings of earlier publications. For example, the study [3] outlined the same technological challenges in the application of BSL formats. One of the recommendations of our study involves the use of high-tech infrastructure and technological advances based on BSL, which should be of high quality to make the hybrid learning environment fast and effective.

In the Kazakhstan context, additional barriers not mentioned in the study [34] were identified: insufficient internet speed in the regions (Table 4), which limits the availability of BSL for rural students; the need for secure data transfer, due to Kazakhstan regulatory requirements [3, 42]; the need for tutoring support to adapt teachers and students to BSL technologies, emphasizing the importance of hardware and personnel. In the Kazakhstan context, additional challenges were identified, such as the uneven development of internet infrastructure between regions and the need to comply with cybersecurity requirements when processing educational data. These aspects, which have previously received insufficient attention in international studies, emphasize the importance of adapting technological solutions to local conditions. Unlike studies [34, 43], which suggest solving infrastructure problems centrally, in Kazakhstan a differentiated, flexible, regionally-oriented approach is required due to significant differences in the availability of resources [42]. Also, if in [3] technological readiness is considered as a basic condition, the results of our study show that even with the presence of infrastructure, the key factors remain the level of digital literacy of teachers; the availability of technical support (tutors); organizational aspects of integrating BSL technologies into the educational process.

- Methodological aspects of BSL implementation

The methodological aspects of BSL implementation also showed both similarities and differences compared to previous studies. The results are consistent with the findings of [12, 13, 28, 45] that flexibility and personalization of learning are highly valued by students (mean satisfaction level is 4.26). In addition, as in [9], interactive methods (e.g. group discussions and feedback) significantly increase engagement.

The observational research design and interviews conducted for the purposes of this study highlighted the transformative potential of BSL technologies in the student learning process, increasing interaction between remote and face-to-face learners. This is consistent with the findings of another study [34], which noted that BSL can encourage a more lively form of learning and facilitate real-time communication between students and teachers.

The results of the conducted study are consistent with the results of the study [10], which states that technological support from IT specialists is crucial for seamless blended learning [43]. The results of our study are consistent with the findings of the University of Sydney and the University of Auckland on the high effectiveness of BSL models combining synchronous and asynchronous learning to support students [29, 43]. It is confirmed that BSL allows for the adaptation of the educational process to the needs that are valued by different groups of students (pace and format convenient for them, different circumstances, such as illness, distance, accessibility, in the absence of a suitable place, large classrooms for a large number of students or time, mobility) [29, 37, 39–42, 45,], including students with special educational needs [18, 40]. A new contribution is the emphasis on the role of instructional design: methodologists and teachers develop materials so that they work equally effectively in online and offline modes, which improves the quality of knowledge acquisition.

This study confirms that despite the benefits of BSL for students, the success of the implementation of Blended Synchronous Learning (BSL) in Kazakhstan universities depends on the level of professional training of teachers [21, 44], which includes not only deep knowledge of the subject area, digital literacy [12, 13], but additional training in working with digital tools for solving specific problems with BSL models to integrate these technologies with advanced pedagogical methods.

Student engagement in the BSL environment remains a

critical factor, especially for online students, who often face limited interaction and technical problems. As well as how group discussions, Teaching Assistant (TA) support and interactive assignments enhance engagement [9]. These results are consistent with the results of our study, in which student-centered methods such as peer feedback and collaboration significantly improved participation. It is vital that the integration of technology into BSL is guided by instructional design, not just technological innovation, ensuring that learning activities are aligned with course objectives.

The data of our study revealed specific methodological difficulties: 1) the traditional focus on teacher control makes it difficult to move to models that assume student autonomy. This expands on the findings of [28, 45], where independence is considered an absolute advantage of BSL. 2) the low readiness of teachers to use digital tools was more pronounced than in [21, 44], which requires the development of specialized retraining programs. 3) adaptation of content to a hybrid format - this aspect was previously overlooked in favor of technological solutions.

Moreover, the interview results also support the findings of the study. The flexibility [8, 11, 18, 28, 45,] and accessibility resulting from BSL teaching [17, 22, 31, 32, 36, 45] play a positive role in students' learning in universities in Kazakhstan. However, teaching through BSL places more expectations on self-organization and self-motivated learning of Kazakhstan students. These results support the findings of another past study [34, 35] that student autonomy was one of the main benefits of BSL and, at the same time, a big challenge in implementing BSL in universities in Kazakhstan. In addition, the overall satisfaction of Kazakhstan students measured by closed-ended questions (Table 6) was found to be high as the overall student satisfaction had a mean value of 4.26, indicating that students benefited from BSL due to the availability of personalized and flexible teaching. This high student satisfaction is also supported by research [12–16] on student attitudes towards the flexibility and accessibility of hybrid learning modes. However, it has also been found that BSL learning also requires students to take on a certain level of responsibility for coordination and preparation.

In addition, BSL teaching demonstrated in the study that remote students find it difficult to communicate with their teachers as well as with students who attend classes. Overall, the results obtained during the interviews confirm that BSL is useful and can be used as a teaching format in Kazakhstan, along with the traditional one. The results of this study also helped to address the challenges faced by universities in Kazakhstan in implementing BSL. The recommendations of our study indicate that for sustainable implementation of BSL, universities in Kazakhstan need to consider different BSL models proposed by Bell J. (2014): "Linked Classrooms", "Shared Portal", "Personal Portals" and "Small Groups" (Tables 1, 4). Institutional support should include training in digital pedagogy, real-time assistance and clear assessment policies, which is consistent with the work of [50]. Furthermore, the findings of the present study extend existing research in that student support through mentoring and coaching and student engagement can be significantly improved by the presence of teaching assistants (TAs) who facilitate communication between remote and face-to-face students, thereby addressing the issue of large student groups [38] and lack of classroom space [39, 42].

In contrast to the recommendations [50], which offer centralized solutions, the Kazakhstan experience demonstrates the effectiveness of pilot projects and phased implementation. Also, contrary to the findings of [28, 45] about the unconditional advantages of student autonomy in BSL, the Kazakhstan experience reveals that there is culturally conditioned resistance from teachers, students' unpreparedness for independent work in new formats, and the need for a gradual transition from the traditional pedagogical model. In contrast to [21, 44], the digital transformation of teaching activities is presented as a relatively smooth process, our study indicates a deeper and more systemic nature of resistance to change, the need for special adaptation programs, and the importance of taking into account local pedagogical experience when implementing innovations. If [50] proposes universal methodological solutions, the Kazakhstan context requires a flexible combination of various pedagogical approaches, the development of intermediate implementation models, and taking into account regional characteristics of the educational process. At the same time, it turned out that the traditional Kazakhstan education system creates additional difficulties in the transition to models that imply greater autonomy for students. This contradicts the findings of [28, 45], where student independence is seen as an absolute advantage of BSL.

In addition, the lack of teachers' readiness to use digital tools was more pronounced than in studies [21, 44], which indicates the need to develop specialized professional development programs taking into account the local pedagogical culture.

In addition, this study developed and analyzed different BSL models to identify their strengths and weaknesses (Table 1), which is also crucial for Kazakhstan universities when choosing appropriate BSL models. The "linked classroom model" allowed for real-time interaction, but requires infrastructure development, which is an issue raised in another study [34]. In contrast, one of the shortcomings of the "common portal model", which is the lack of motivation and interaction among students, is also noted in another study [3].

Thus, the present study not only confirms a number of known patterns associated with BSL, but also contributes to the understanding of the specifics of its implementation in developing countries. The identified features, such as the influence of regional infrastructure, cultural aspects of the educational process and the need for adaptive organizational strategies, expand existing theoretical concepts and offer practical solutions relevant for countries with similar conditions.

V. Conclusion

This research has provided a comprehensive analysis of the current state of BSL practices and the challenges associated with their implementation in higher education institutions (HEIs) in Kazakhstan. Key findings highlight the necessity of structured curriculum planning and lesson development to ensure effective interaction between face-to-face and online students.

One of the critical aspects of successful BSL

implementation is identifying and addressing students' diverse learning needs. Ensuring mutual respect and active participation among remote and in-class students is vital for fostering an inclusive learning environment. The study also underscores the importance of using online cameras and other interactive tools to enhance engagement and interpersonal communication between students and instructors.

The research has identified several major factors that influence the effectiveness of BSL, including the availability of appropriate technological infrastructure, sufficient financial resources to support BSL initiatives, and adequate faculty training in BSL methodologies. These elements play a crucial role in the seamless integration of BSL into the higher education system. Additionally, this study highlights the comparative advantages of BSL over traditional and fully online learning approaches, such as increased flexibility, enhanced student engagement, and improved accessibility to educational resources.

To further explore the potential of BSL, future studies should focus on the long-term effects of this learning model on student outcomes and academic performance. Comparative research between BSL, traditional classroom instruction, and fully online education could provide valuable insights into student engagement, knowledge retention, and skill development over extended periods.

VI. Limitations

Despite its advantages, Blended Synchronous Learning (BSL) faces several limitations. Its dependence on technology makes it vulnerable to internet issues, outdated equipment, and software incompatibility. Not all students possess the self-discipline required for effective learning in this format, and online participants may experience isolation. Teachers also struggle to adapt to the dual-mode format, which demands significant effort.

Additionally, implementing BSL requires substantial financial investments in infrastructure and faculty training. Future research should assess the long-term impact of BSL, its effectiveness across different disciplines, its influence on student motivation, and the best pedagogical strategies. Studies on faculty training, technological requirements, and institutional support are equally important. Comparing BSL with traditional and fully online methods will help identify its strengths and weaknesses, which is crucial for its sustainable development.

VII. Recommendation

A. Further Research

To further explore the potential of BSL, future research should focus on the long-term impact of this learning model on student outcomes and performance. Comparative studies of BSL, traditional classroom learning, and fully online education can provide valuable insights into student engagement, knowledge retention, and skill development over long periods of time.

Additionally, further research is needed on the psychological and instructional aspects of BSL, such as its impact on students' motivation, levels of participation, and sense of belonging in a hybrid learning environment. Investigating whether certain subjects or disciplines are more suitable for BSL than others could provide essential guidance for curriculum development. Moreover, an analysis of the effectiveness of BSL for different types of learners—such as visual, auditory, and kinesthetic learners—could lead to more tailored instructional strategies.

Faculty development remains another critical area for future exploration. Research should focus on designing professional development programs that equip university instructors with the skills necessary to manage both online and in-person students effectively. This includes training in the use of digital tools, strategies for fostering student engagement, and techniques for maintaining instructional quality across different learning modalities. Developing standardized recommendations for academically rigorous and accessible model's BSL courses will be instrumental in advancing blended synchronous learning in higher education.

Developing standardized guidelines for academically rigorous and accessible BSL courses also represents an important direction for future research to facilitate the further development and implementation of blended synchronous learning in higher education.

B. Practical Recommendations

BSL is an innovative approach that effectively combines the advantages of traditional in-person education and modern digital technologies. Its significance for higher education is supported by a body of evidence presented in the study, along with additional arguments highlighting its effectiveness.

First, BSL provides learning flexibility, allowing students to choose between in-person and remote participation. This is particularly beneficial for:

- Students from remote regions, who gain equal access to educational resources;
- Working students, who can balance studies with professional commitments;
- Individuals with disabilities, for whom the remote format reduces accessibility barriers.

Secondly, BSL fosters active interaction between students and instructors, regardless of location. Specifically:

- The use of video conferencing (Zoom, MS Teams) and interactive tools (chats, forums);
- Enhancing feedback efficiency through AI-powered assistants and adaptive assessments.

Thirdly, personalized formats (e.g., the "Personal Portal" model) allow for adaptation to individual student needs, which is particularly crucial for highly complex disciplines.

Fourthly, BSL prepares students for the digital economy by:

- Developing in-demand digital skills through the use of LMS (Moodle, Canvas), cloud services (Google Drive), and collaboration tools (Slack);

BSL is not merely a temporary solution but a strategically important model for the sustainable development of education.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Issabayeva D. developed the research concept and design,

and contributed to data analysis and interpretation of results. Aryn A. was responsible for methodology development, including the design of models. Sadirbekova D. and Nishanbayeva S. were responsible for data collection and analysis, conducting observations and interviews, and assisting in organizing the research process. Issabayeva D. and Abdulkarimova G. jointly analyzed the data and interpreted the results, contributing significantly to the conclusions of the study. Issabayeva D., Abdulkarimova G. drafted the manuscript, structured the content, and organized the text. Abdigapbarova U. critically revised the manuscript, suggesting improvements and making corrections to enhance the quality of the paper. Kulsariyeva A. and Kaliyaskarova E. contributed to writing—review and editing, offering critical feedback and revisions during the preparation and finalization stages. All authors approved the final version of the manuscript and participated in its final preparation.

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