Blended Learning through Flipped Classrooms in the CAREC Region: Designing a Data-Driven Flipped Classroom Program

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introducing

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introducing

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Study Background and Rationale

Learning Crisis and the Need for Action

- Worldwide (250 M learning poor)

Learning Poverty

Impact of COVID-19

- Lower- and middle-income countries 71%

Global Challenge

Obstacles in Developing Nations

Role of Technology in Improving Education

Blended Learning (BL)

Flipped Classroom Model (FCM)

This study aims to develop a region-specific FCM in four CAREC countries, accounting for varying levels of technology integration, such as Kazakhstan's advanced use of technology.

Study Focus

Study Objectives and Scope

To develop a region-specific blended learning module for the Flipped Classroom Model in four CAREC nations—Kazakhstan, Pakistan, Tajikistan, and Uzbekistan—by focusing on public school students in grades 9 and 10.

.

1

Identify the critical requirements for developing an FCM in CAREC countries

2

Assess the feasibility of adopting the different FCM Models

3

Develop policy and program-based recommendations for blended learning in CAREC

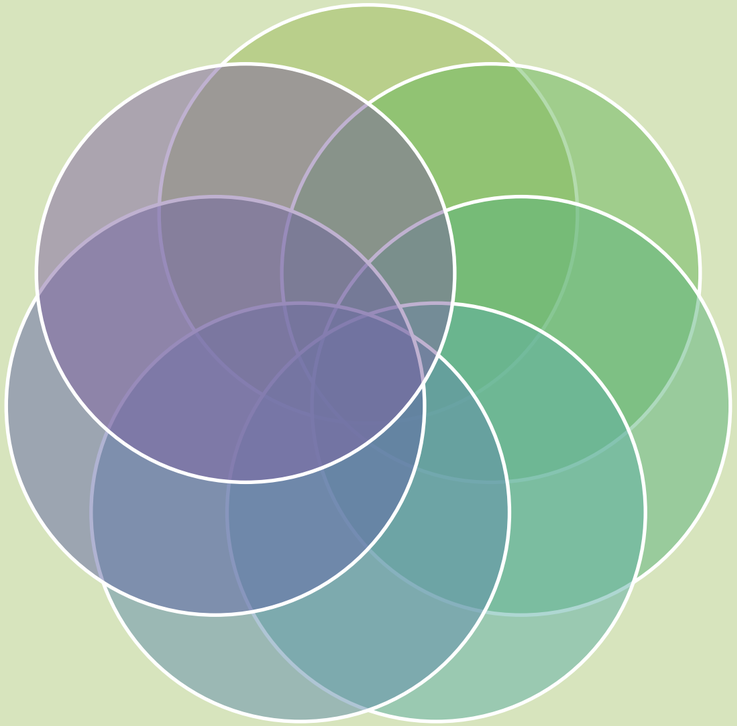
Country Context

Digital Transformation Leader: Strong initiatives like *Digital Kazakhstan*

E-Government Development Index: Ranked 28th globally.

The pandemic highlighted gaps in internet infrastructure and effective online learning delivery.

Internet Speed: 43rd globally; Mobile: 34.07 Mbps, Fixed Broadband: 44.94 Mbps.



Need for stronger teacher training to improve (BL) models.

Internet Penetration Rate: 91%.

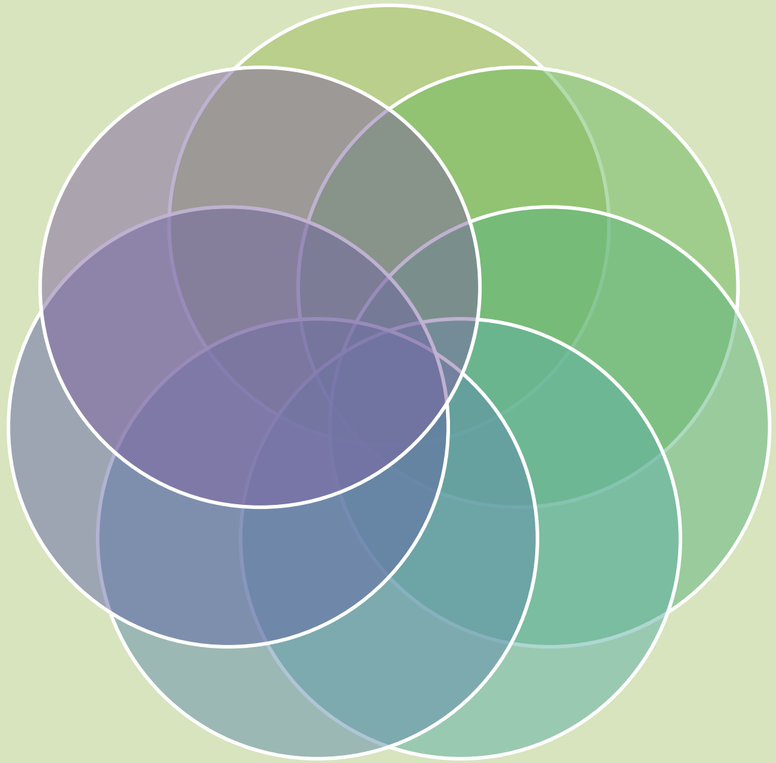
Limited digital infrastructure and IT capacity.

Available Platforms: BilimLand, Kundelik, Kenes, Mektep.kz.

Country Context

Gender disparities, rural-urban divide, and inadequate resources. Many children drop out early or lack access to quality education

Socioeconomic constraints in rural areas, poor digital infrastructure, and connectivity issues.



E-Government Development Index: Ranked 150th globally.

EdTech Adoption: TV and mobile phones during the pandemic (*Taleem Ghar*, *Teleschool*).

Internet Speed: Mobile: 10.15-15.5 Mbps, Fixed Broadband: 10.15-15.5 Mbps.

Available Platforms: e-Learn Punjab, TeleSchool, Sabaq.pk, Khan Academy.

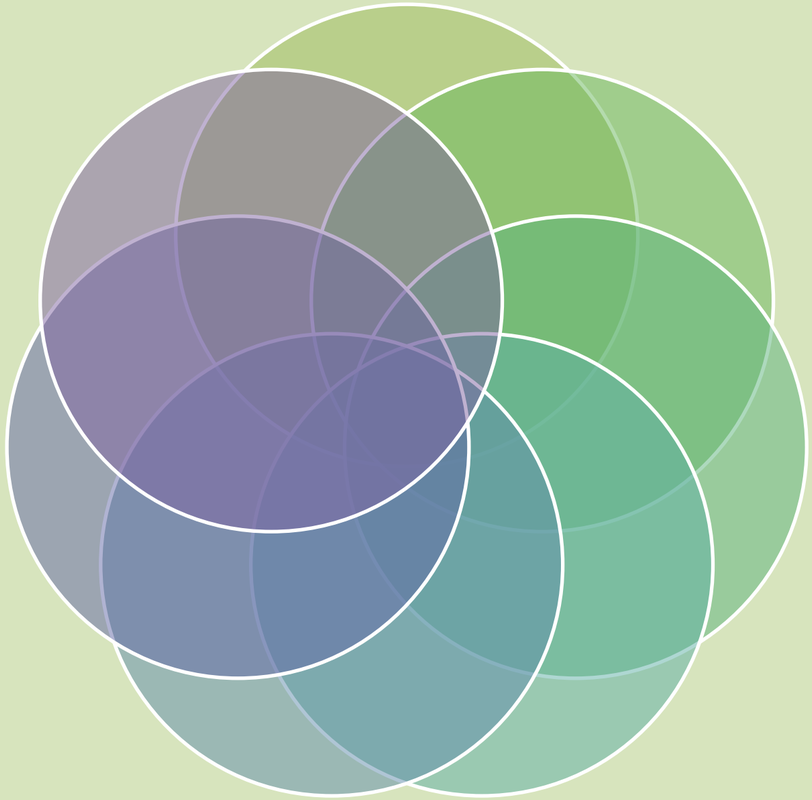
Internet Penetration Rate: 36.7%.

Country Context

Moderate Digital Progress: Focus on inclusivity and tailored instruction with in-house platforms.

Need for further investment in digital skills development and infrastructure to support wider digital adoption.

E-Government Development Index: Ranked 69th globally.



Significant rural-urban divide in access to education technology.

Internet Speed: Mobile: Ranked 95th globally, Fixed Broadband: 90th globally.

Available Platforms: Talim.uz, Edu Market, Eduportal, Kitob.uz.

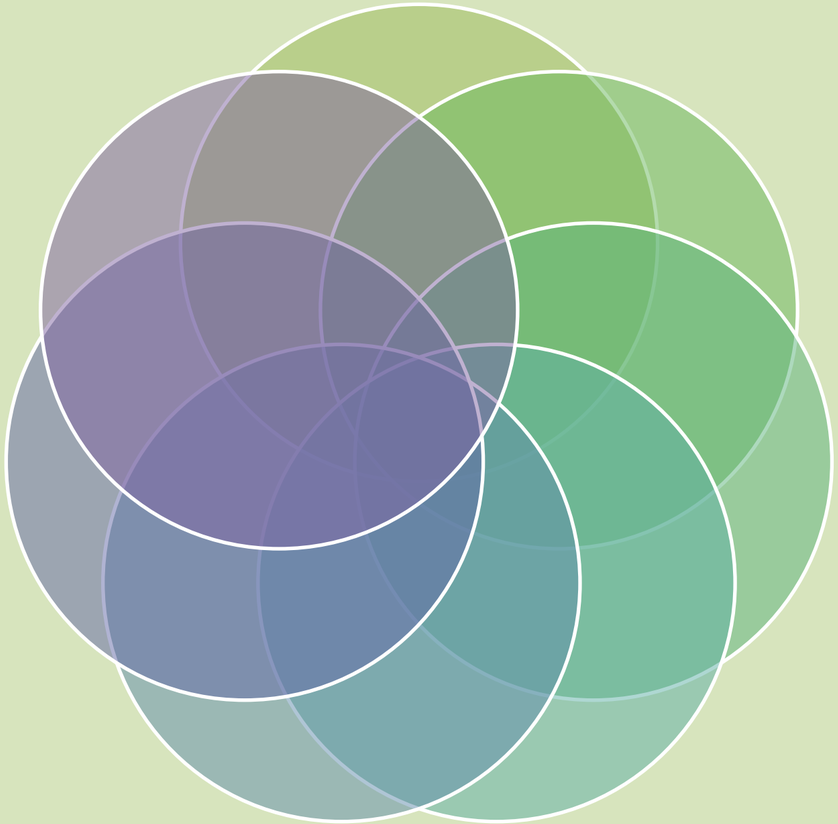
Internet Penetration Rate: 76.6%.

Country Context

Severe Digital Divide: Vulnerable education system with weak digital infrastructure and poor teacher digital skills.

Significant underfunding and infrastructure issues in public schools.

E-Government Development Index: Ranked 129th globally.



Low digital literacy and connectivity in rural areas.

Internet Speed: Mobile: 5.45-8.15 Mbps, Fixed Broadband: 26.35-27.28 Mbps.

Available Platforms: E-Maktab, E-Donish, Kitobkhana.tj, Kitobdust.

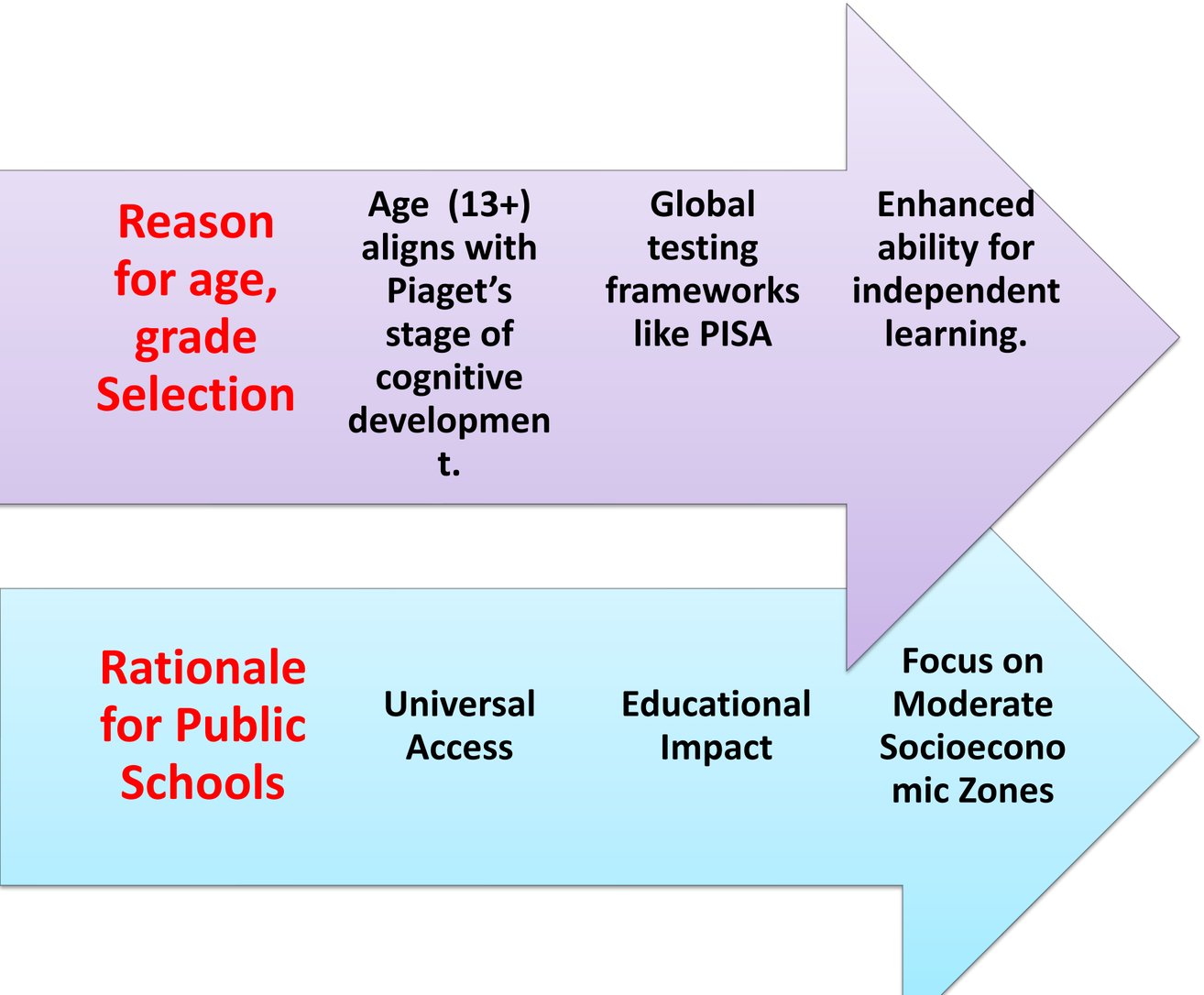
Internet Penetration Rate: 35.44%.

Study Methodology and Sampling

Target Population

Countries: Pakistan, Kazakhstan, Uzbekistan, Tajikistan

Students: Grade 9 & 10 public school students



3-Stage Random Sampling

- Two districts from each country (moderate HDI zones).
- One boy's school and one girl's school (or co-ed) from each district.
- Random selection of students (17-18), teachers (3), and administrators (1) per school.

Selected Sample

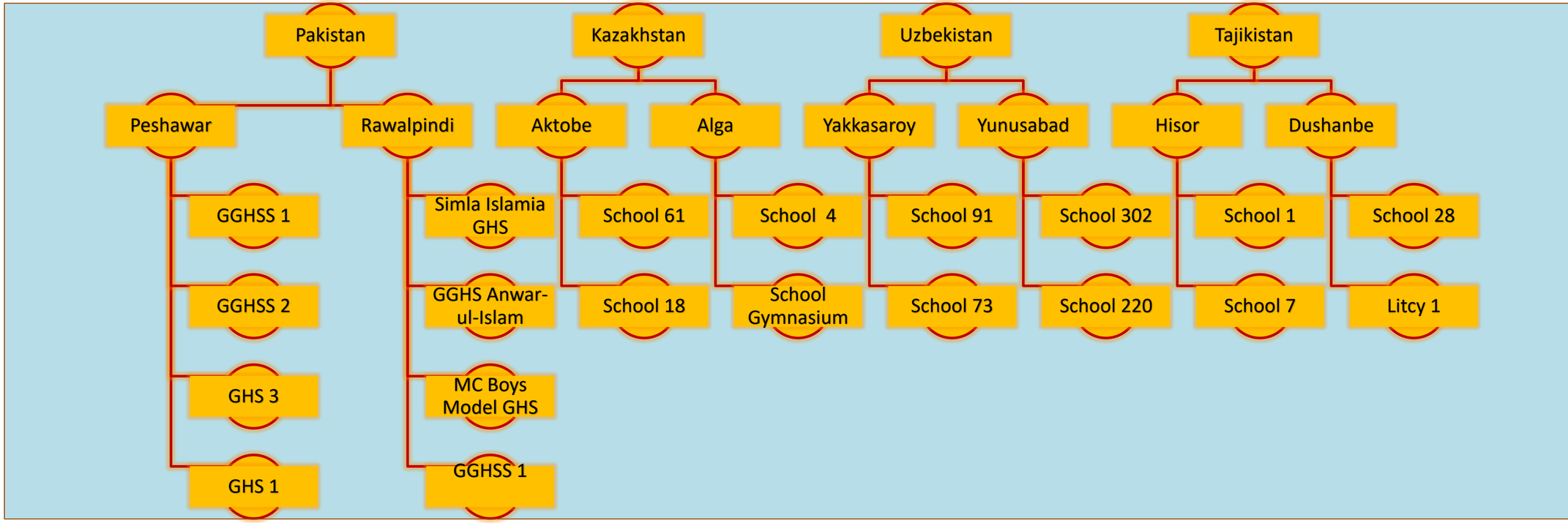


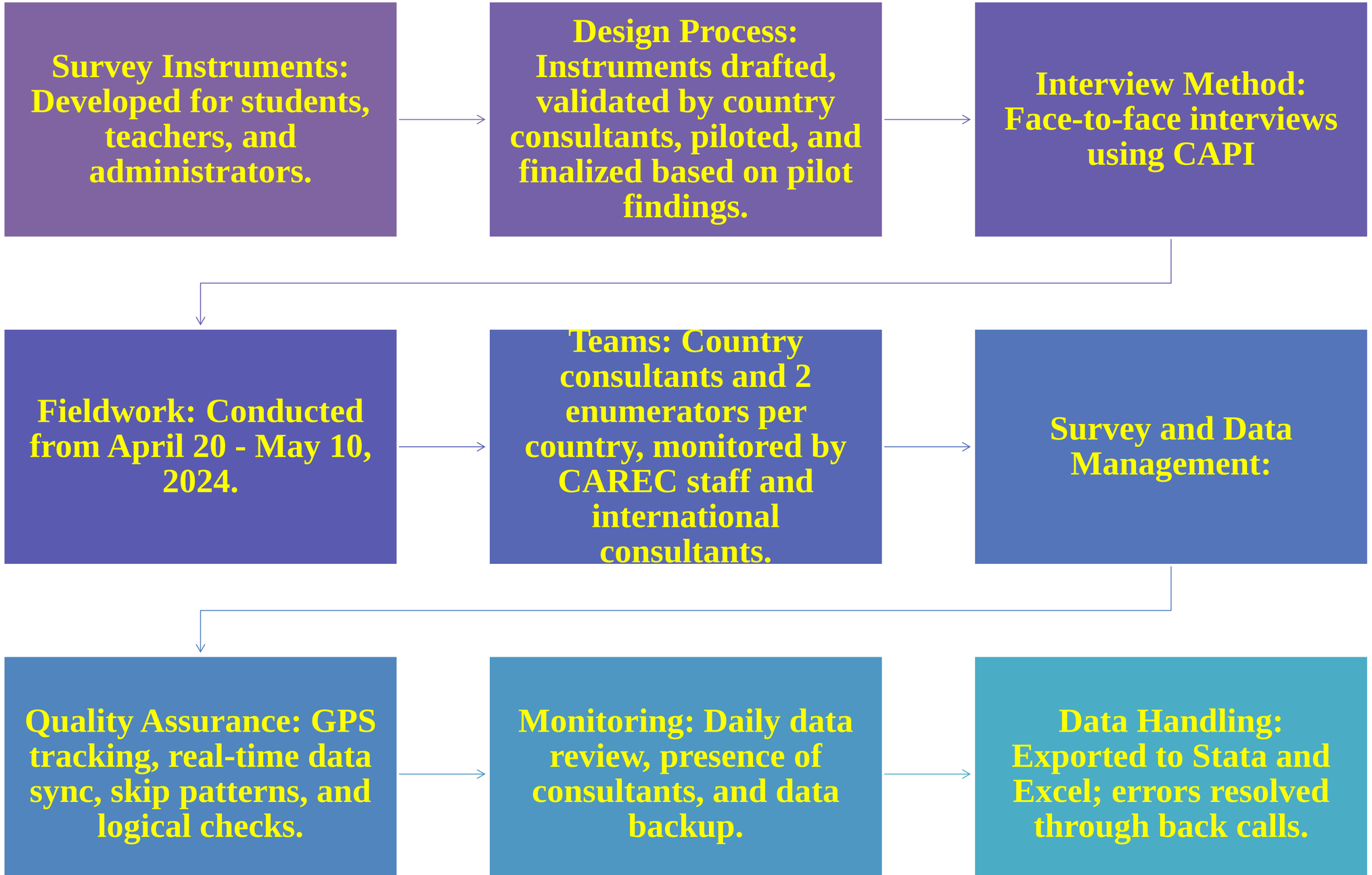
Table 6: Student Sample (District, Gender, Age and Grade wise)

Country	District	Mean Age	Students	Male	Female	9th	10th	Total
Pakistan	Rawalpindi	14.8	76	39	36	76	0	148
	Peshawar		72	37	36	19	53	
Kazakhstan	Aktobe	15.27	34	17	17	23	11	
	Alga		36	15	21	16	20	70
Uzbekistan	Yunusabad	15.73	36	12	24	16	20	
	Yakkasaro		36	19	17	25	11	72
Tajikistan	Hisor	15.79	36	19	17	17	19	
	Dushanbe		36	18	18	17	19	72
	Total	15.27	362	176	186	209	153	362

Table 7: Respondents Division (District, Gender and Subject Specialization)

Country	District	Teachers	Male	Female	National Language	English Language	Computer	Science	Arts	Total
Pakistan	Rawalpindi	12	6	6	2	2	2	4	2	24
	Peshawar	12	6	6	0	2	0	8	2	
Kazakhstan	Aktobe	6	1	5	0	2	0	4	0	11
	Alga	5	1	4	0	2	2	1	0	
Uzbekistan	Yunusabad	6	0	6	2	1	1	2	0	
	Yakkasaroy	6	0	6	2	2	0	2	0	12
Tajikistan	Hisor	6	3	3	1	0	2	2	1	
	Dushanbe	6	3	3	0	2	0	3	1	12
	Total	59	20	39	7	13	7	26	6	59

Data Collection Process



Data Analysis

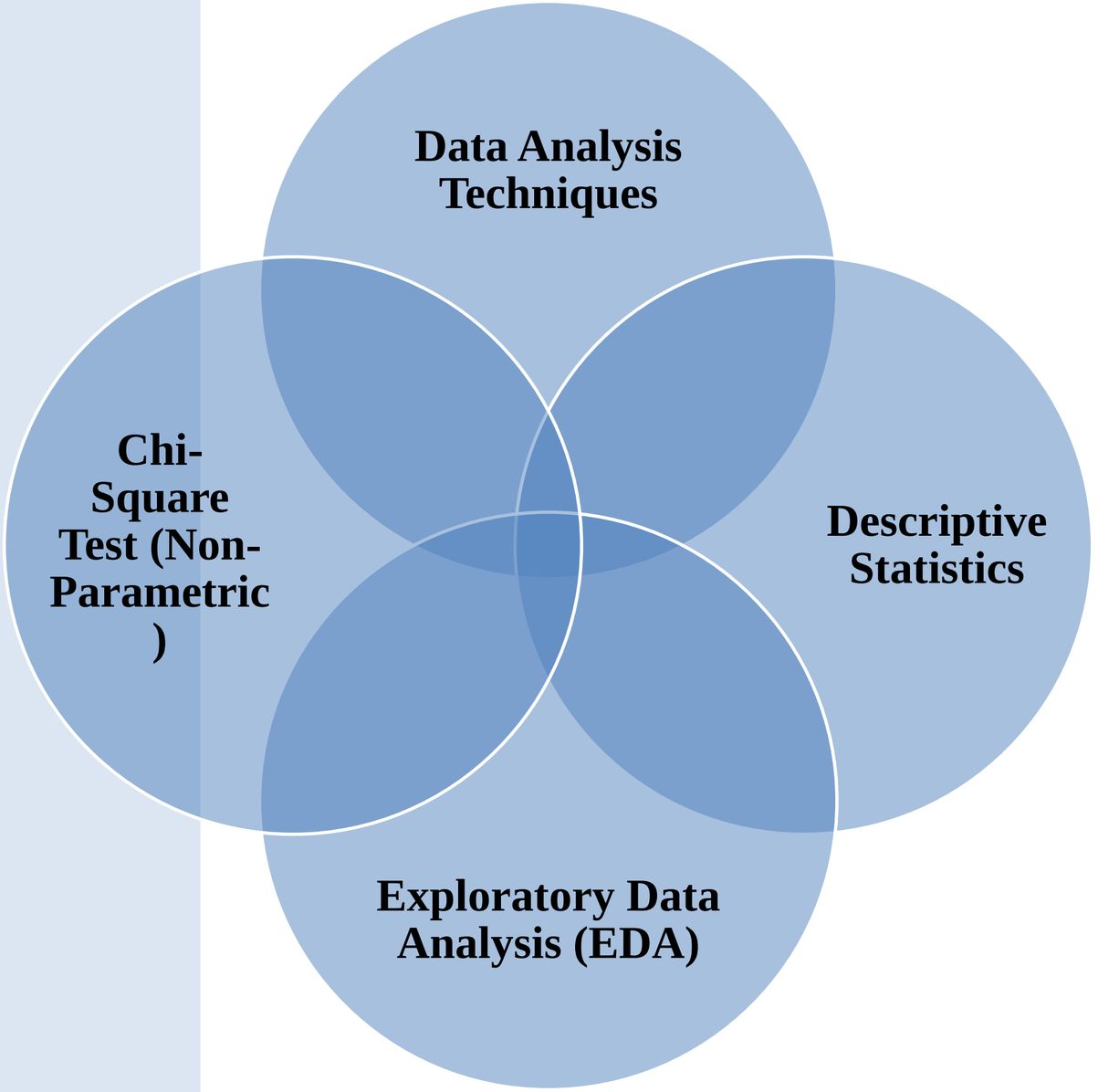
Data Cleaning and Preparation

- **Verification**: Entries checked against respondent IDs, discrepancies resolved, duplicates removed.
- **Missing Data**: Identified missing entries due to skip patterns or data errors; rectified through follow-up calls.
- **Text Standardization**: Qualitative text entries reviewed and standardized for consistency.
- **Validation**: Logical range checks (e.g., correcting implausible age entries).

Qualitative Analysis

Thematic/content analysis of FGDs and open-ended responses.

- Insights used to refine policy suggestions and program design.



THEORETICAL FEATURES OF FCM

Delivery Time of VLs

- Before Class
- During Class
- After Class

Ideal Location to Watch VLs

- Home
- CL

FCM Course Coverage

- All subjects
- Specific Subjects

FCM Content /Variety

- Problem solving VLs
- Short, animated, interactive and engaging VLs
- VLs explaining complex subjects
- Content and topics of student's interest
- Short Text
- Audio lectur etc.

Ideal VL Length

- Short clips(6 to 15 minutes)

Ideal VL Language

- Local
- National
- Foreign

VL Resource Person

- Teacher
- Best Tutor Globally
- Students in class
- Students Globally

Frequency of VLs and Assessments

- Before every class
- Weekly
- Bi-weekly

Content Transmission/Sharing Tools

- Sophisticated such as LMS
- Video hosting such as youtube channel
- Communication and messaging such as Wechat, whatsapp, telegram

Ideal Features of Online Platform/LMS

- Accessible and easy to operate,
- Orgnises content well
- Facilitates comunication with peers and teachers
- Simplifies quiz attempt and grading
- Tracks and updates on student progress
- Adaptable to user specific needs
- Secures privacy
- Provides technical support

Course Plan

- Should plan pre class, in class, after class activities and content in advance
- CP be shared in advance
- Students opinion and attitude be considered in CP

Study Findings and discussions at the Country Level

Socio-Economic Profiles of the Respondents

Student Demographics

- The study covers 362 students from Pakistan, Kazakhstan, Tajikistan, and Uzbekistan, with an average age of 15.
- A vast majority (90%) are from urban areas.
- Most students' families are literate(except Pak), employed, and speak local languages, suggesting a supportive environment for education.

Teacher Data

- The average age of teachers is 39, with 66% being female.
- Some of the teachers have vocational or IT training, emphasizing a need for further development in these areas to support FCM.
- Most teachers work full-time and are generally satisfied with their roles, though dissatisfaction with pay is prevalent.

Administrative Workforce:
Administrators, predominantly male (71%), have a wide range of experience and varying levels of vocational training, highlighting a need for targeted professional development.

Study Findings and discussions at the Country Level

Type, Quality and Access to the Internet by Students, Teachers and Schools(Kazakhstan)

100% Internet Penetration

Reliable and Fast Internet:

Educators also report reliable internet, but financial pressures from other educational necessities persist.

FCM Feasibility: government investment to expand infrastructure further.

Type, Quality and Access to the Internet by Students, Teachers and Schools(Pakistan)

Pakistan: Internet Connectivity for BL Integration

Low Connectivity: 10% of students lack internet access, posing challenges for (BL).

Most rely on (MD); (BB) access is limited.

High Internet Costs: Students and teachers view internet expenses as a financial burden.

Limited Infrastructure:

50% of schools lack BB, hindering online resource access.

Challenges: The digital divide and high costs impede BL integration, especially in economically disadvantaged and rural areas.

Type, Quality and Access to the Internet by Students, Teachers and Schools(Uzbekistan)

Uzbekistan

Good Student Connectivity

Equal Use of MD and BB:

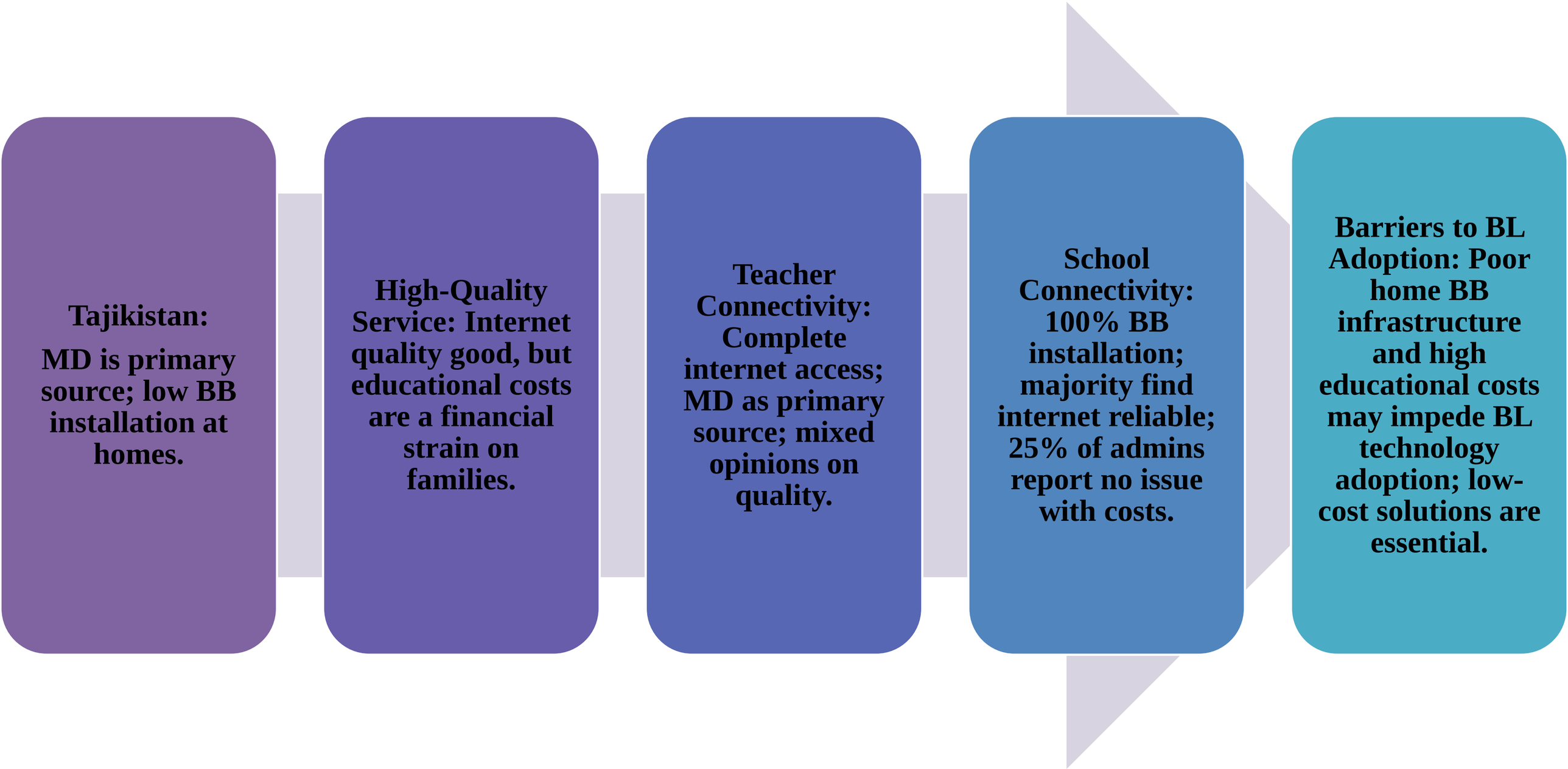
Financial Burden: Students and families view educational costs as burdensome

Teacher Connectivity: Complete internet access; BB as primary source; teachers report difficulties with daily expenses.

School Connectivity Issues: 40% of schools lack BB, relying on MD; only 20% of administrators find internet costs manageable.

Challenges for BL Integration: Inadequate infrastructure and financial strain on families may hinder adoption of BL technologies.

Type, Quality and Access to the Internet by Students, Teachers and Schools(Tajikistan)



School Infrastructure, Teaching Practices and Use of Educational Technologies

School Facilities
Generally satisfactory; need improvements in power backup, digital libraries, transport, and dispensaries.
Internet and IT Equipment
High satisfaction with internet; 27% of students request better IT equipment.
Technology Use
Over 90% of students use SB, MM, and CL regularly;
Student and Teacher Satisfaction
75% of students feel facilities enhance learning; varied views on IT impact on performance.
Focus Areas
Need for enhancements in internet connectivity, digital libraries, and further IT integration in school activities
Teacher Training
Many teachers lack IT/vocational diplomas; need for further faculty development.
Infrastructure
Schools well-equipped with IT resources; 75% of admins confirm readiness for FCM implementation with ongoing need for training and support.

School Infrastructure, Teaching Practices and Use of Educational Technologies

Current Satisfaction: Generally satisfied with instruction, school facilities, and environment; libraries and digital libraries need improvement.

Internet Quality: Low satisfaction; only 26% of students and 16% of teachers have a favorable opinion. Urgent need for better internet access and BB installation.

IT Device Use: Limited access to SBs, MMs, and CLs; average of 14 computers per school with minimal IT gadgets. Low frequency of online resource use.

Infrastructure Needs: Significant gaps in IT equipment, digital libraries, and basic amenities; low government support.

Student Preferences: Favorable towards Edtech; interested in FCM for math, physics, English, and biology.

Challenges: High student-teacher ratio (46:1), lack of professional training for teachers, and inadequate IT infrastructure.

Recommendations: Invest in IT equipment, improve internet access, and enhance faculty training for effective FCM implementation.

Access, Usage and Training Requirements of IT Devices and Online Platforms

School Conditions
Good overall; satisfactory playgrounds, buildings, IT device use, and healthy environment.
IT Device Utilization
Excellent potential; frequent use of SBs, MMs, and CLs; students report restricted availability, but teachers do not.
Instruction Quality
Teachers use IT devices regularly; students are satisfied with teaching quality.
Student Perceptions
Technology seen as a significant contributor to academic performance; desire for BL in science, math, English, and social studies.
Infrastructure Needs
Improvements needed in internet quality, digital libraries, transportation, and power supply.
Teacher Development
Many teachers hold master’s degrees but lack professional training; need for faculty development programs.
Recommendations
Enhance internet quality, invest in digital resources and physical infrastructure, and improve faculty training for effective FCM implementation.

School Infrastructure, Teaching Practices and Use of Educational Technologies

Physical Infrastructure
Generally good; satisfaction with sports facilities, buildings, and access to IT gadgets.
IT Device Use
Schools have 76 computers, 14 SBs, and 14 MMs; 60% of admins report daily use of SB and MM.
Contradictory Opinions
35% of students and 50% of teachers report limited or no access to SB, MM, and CL; restricted availability noted.
Infrastructure Needs
Improvements needed in transportation, medical facilities, internet access, and IT resources; significant demand for better internet quality.
Teacher Skills
Teachers are well-qualified but lack pedagogical training; need for faculty development to effectively implement FCM.
Student Preferences
Students find Chemistry, Math, Physics, and English challenging; prefer BL approaches for these subjects.
Recommendations
Address IT and human resource gaps, enhance internet access, and invest in infrastructure for effective implementation of FCM.

Device & Platform Accessibility and Training Needs

Device Access: Over 90% penetration; widespread availability of SPs, laptops, iPads/tablets, and PCs.

Current Usage: Devices like SPs and laptops are commonly used for educational purposes.

Training Needs: Both teachers and students require training on device use and platforms.

Popular Platforms: Internet browsers, YouTube, messaging apps (WhatsApp, Telegram), MS Office, Google Classroom, Daryn Online, Bilim Land

Recommendation: Provide training on devices and platforms before implementing FCM

Device & Platform Accessibility and Training Needs

Device Accessibility: Low to moderate; 50-60% penetration; limited access to laptops, PCs, and tablets.

Digital Divide: Lower access in middle- and lower-income districts; significant barrier to FCM adoption.

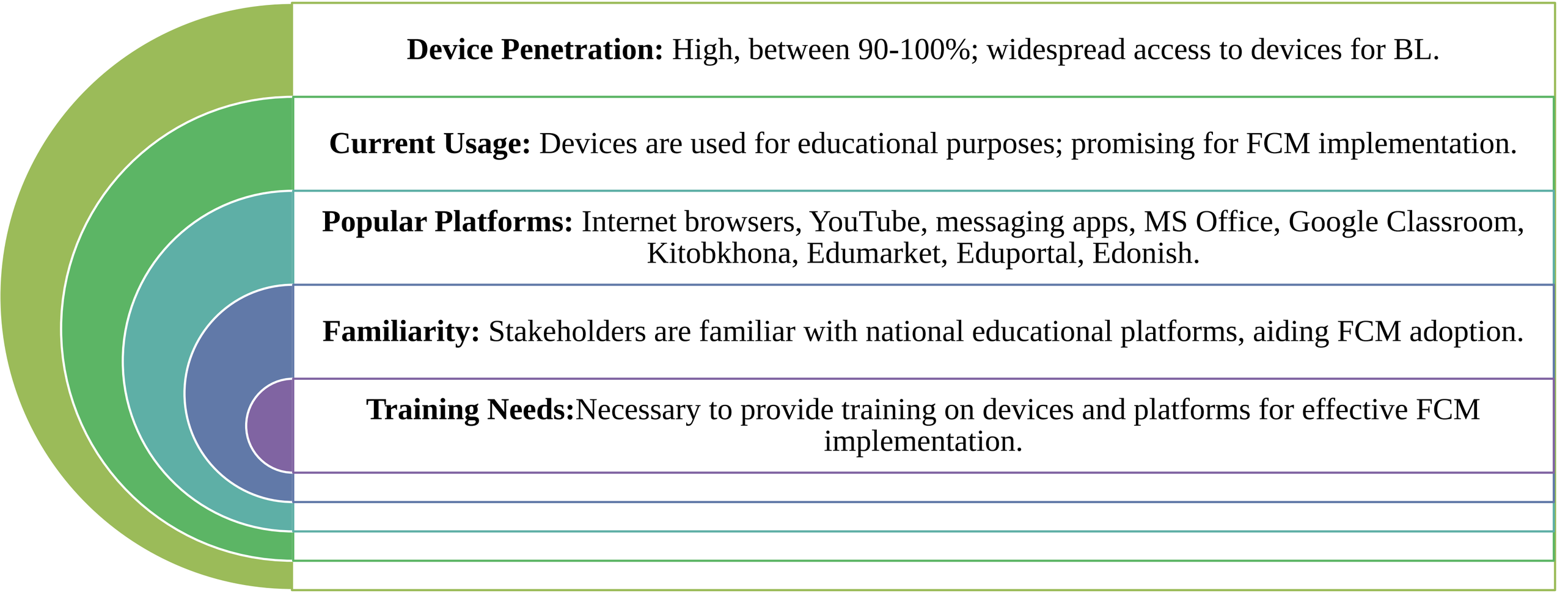
Digital Literacy: Low among those with access; potentially zero among those without.

Popular Platforms: Internet browsers, YouTube, WhatsApp, MS Office; used for both leisure and education.

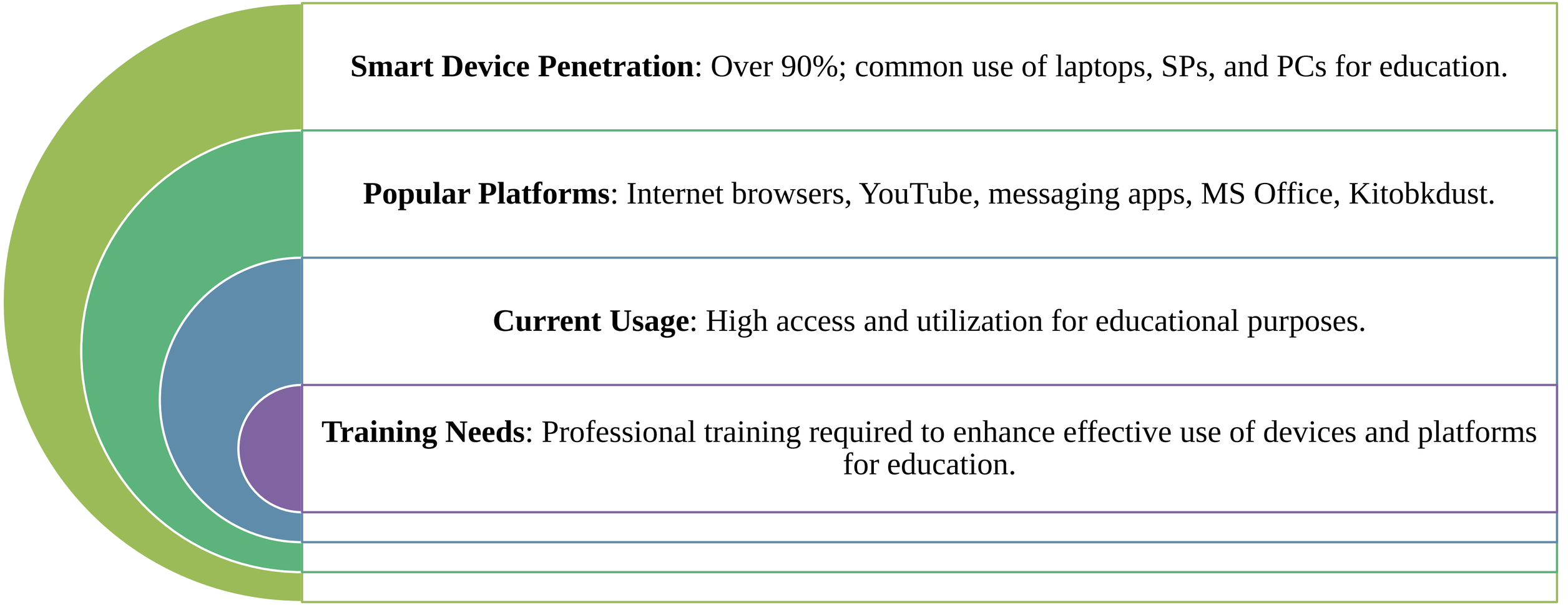
Training Needs: 50% of students and 25% of teachers need training to effectively use platforms for education.

Recommendation: Invest in improving device access and digital literacy; implement policy interventions for an equitable learning environment.

Device & Platform Accessibility and Training Needs



Device & Platform Accessibility and Training Needs



Smart Device Penetration: Over 90%; common use of laptops, SPs, and PCs for education.

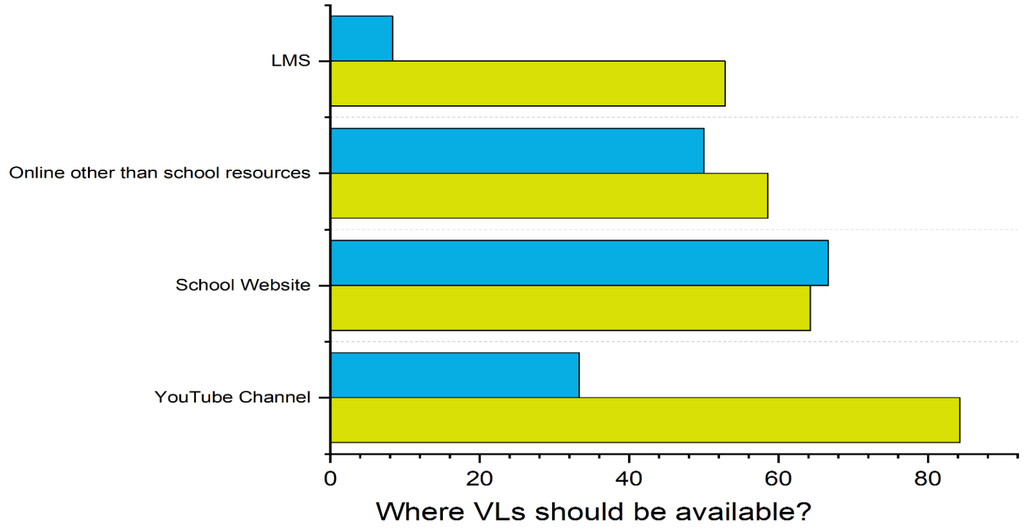
Popular Platforms: Internet browsers, YouTube, messaging apps, MS Office, Kitobkdust.

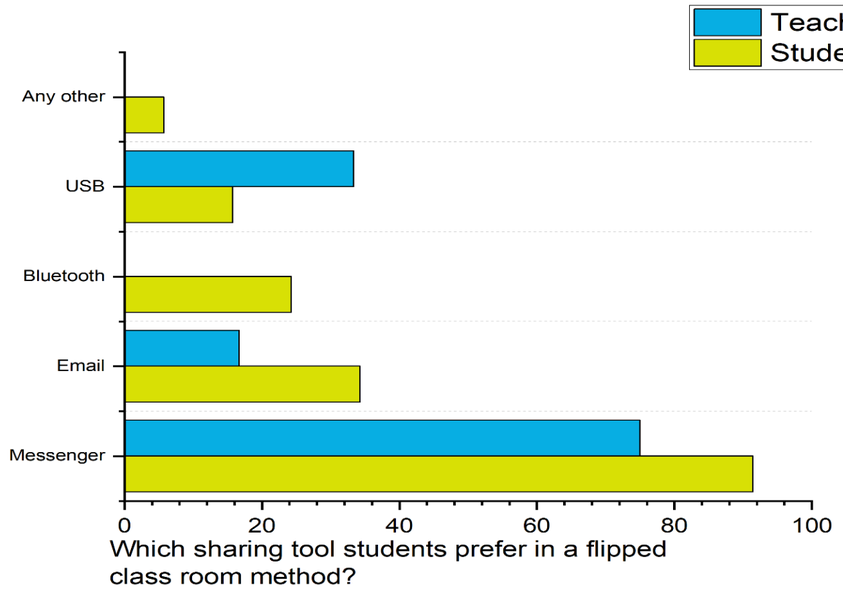
Current Usage: High access and utilization for educational purposes.

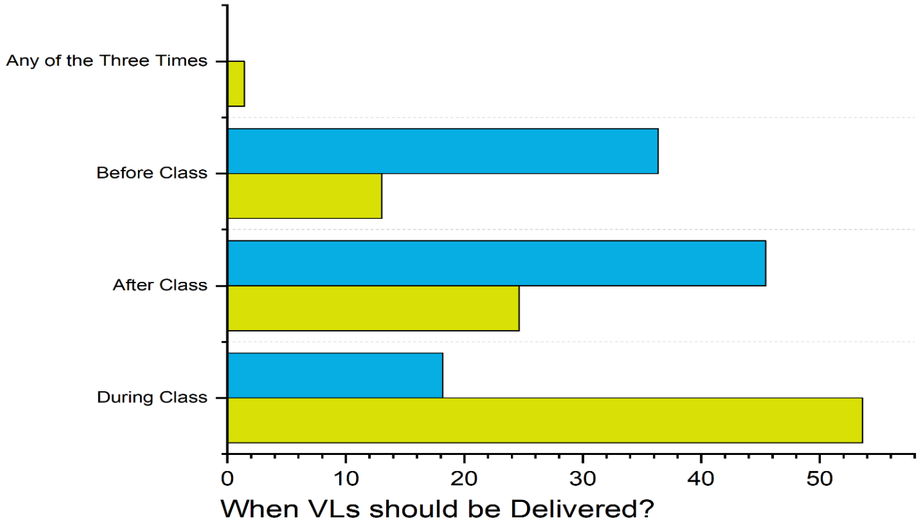
Training Needs: Professional training required to enhance effective use of devices and platforms for education.

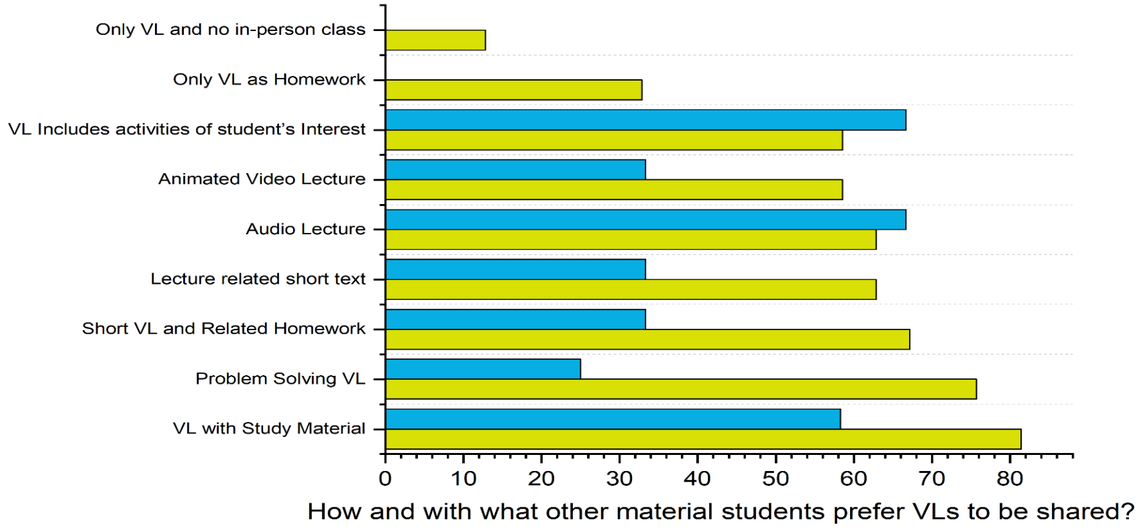
Analysis of Country-wise FCM Features

FCM features Kazakhstan (a)

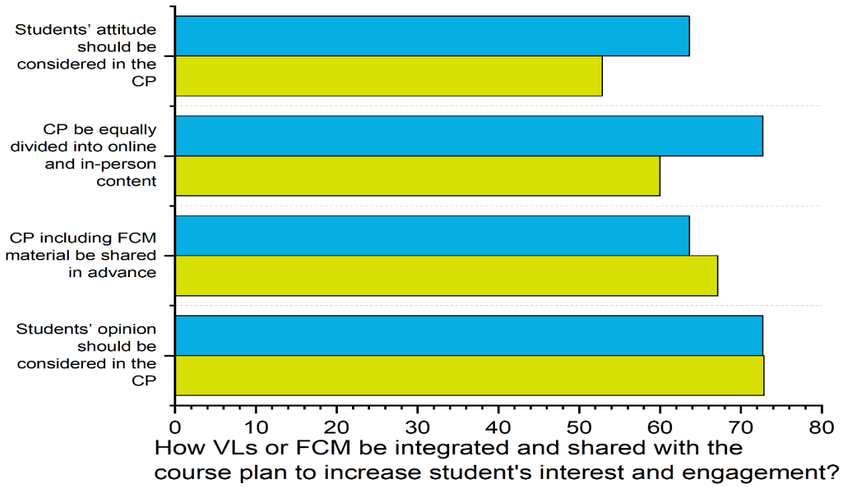


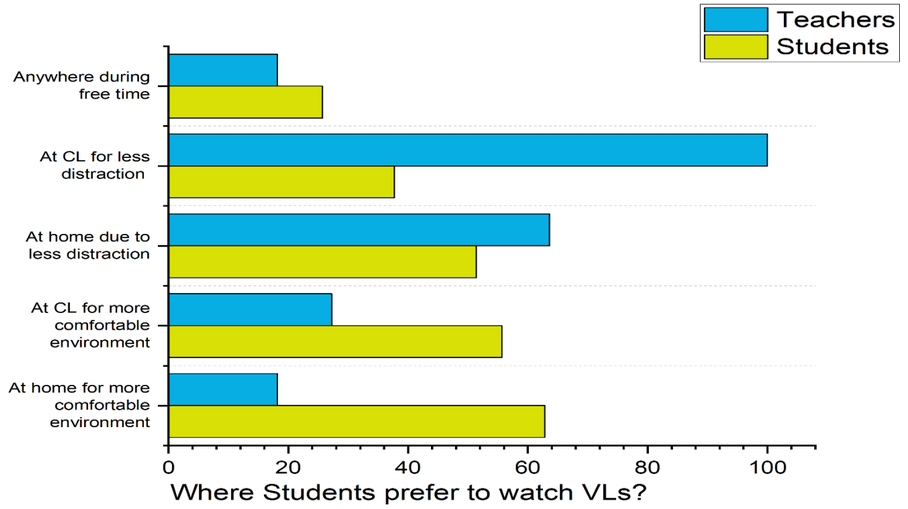


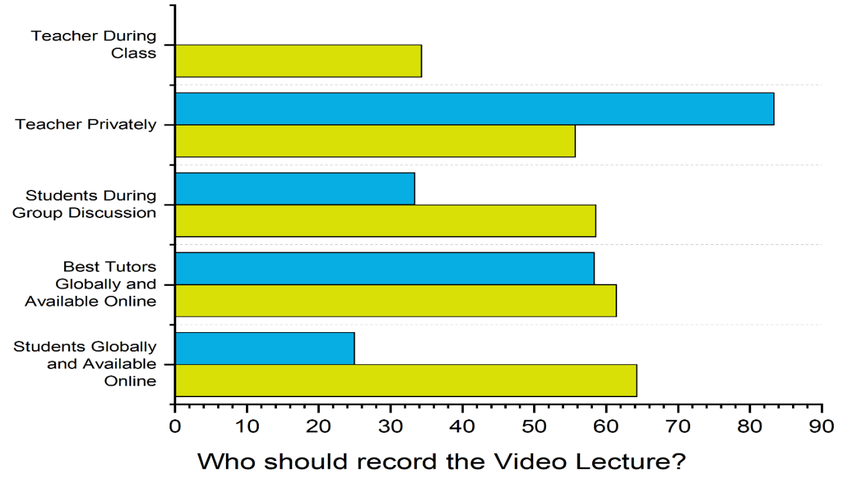


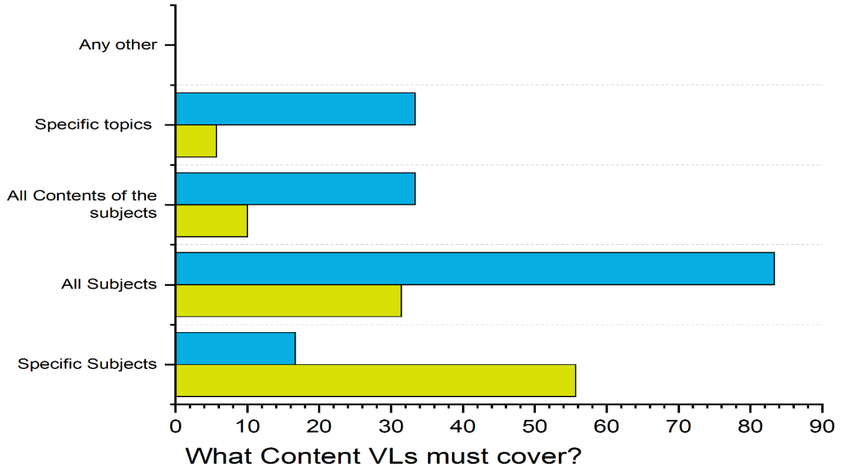


FCM features Kazakhstan (b)

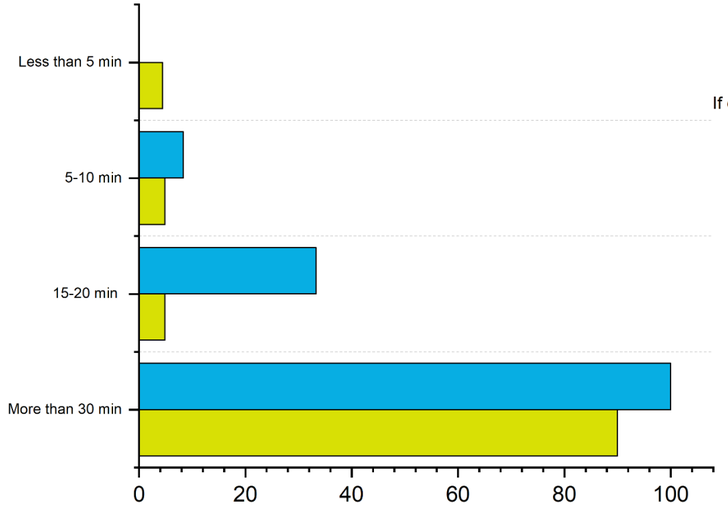




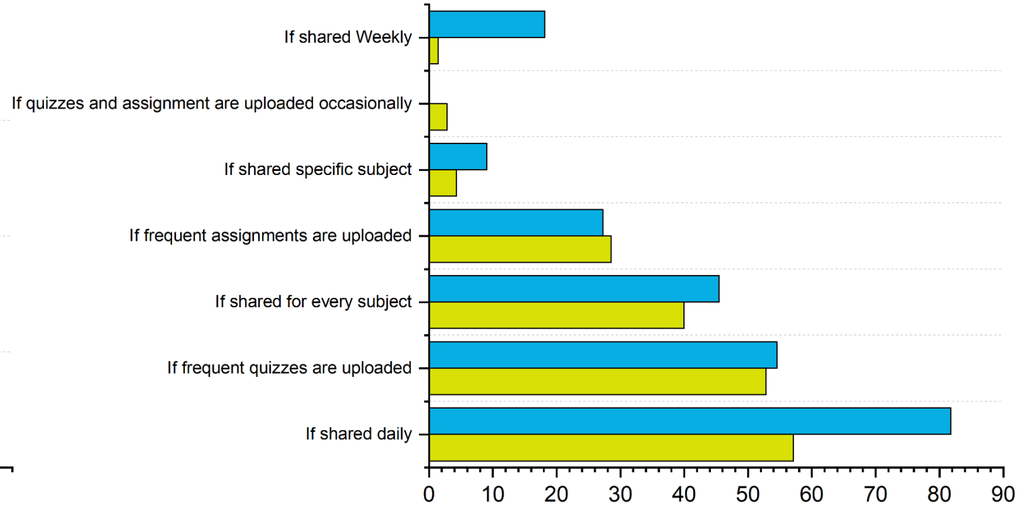




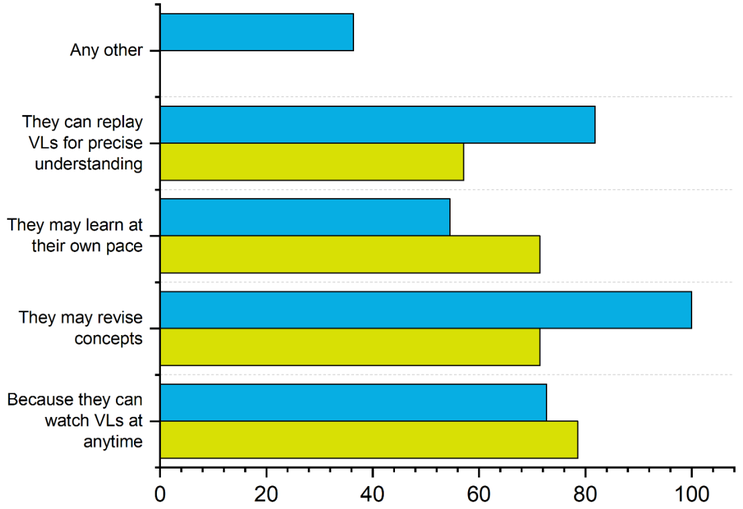
FCM features Kazakhstan (c)



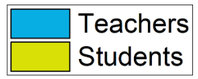
What should be the ideal length of the VLs to avoid overburden and keep students motivated?



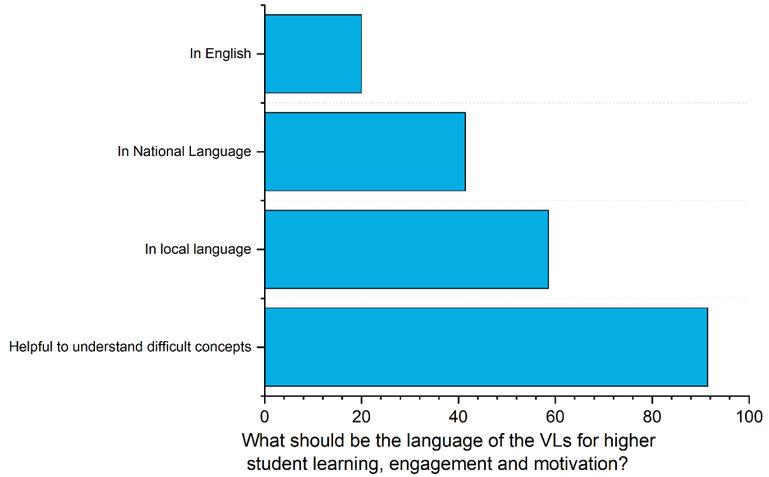
What Frequency of VLs, online quizzes and Assignments will overburden student?

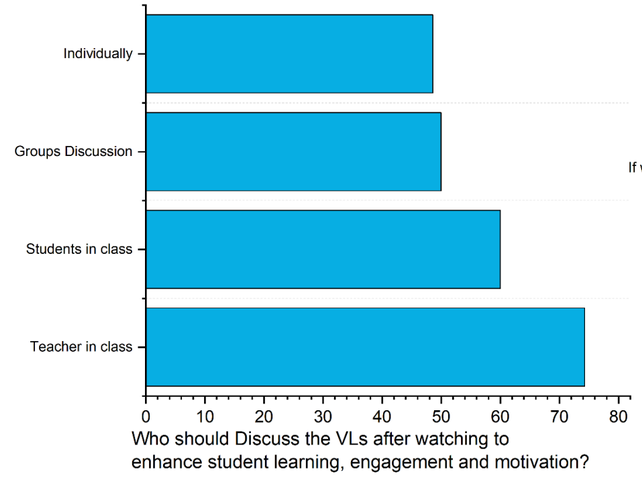


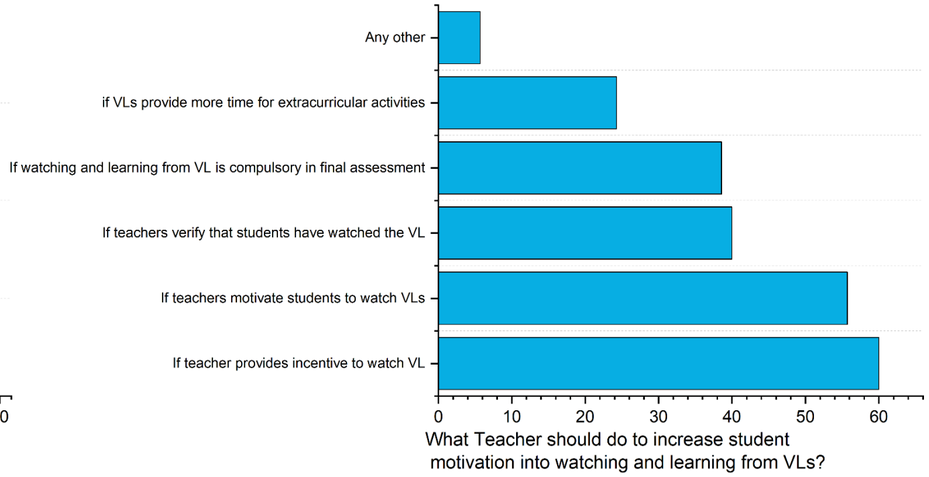
How VLs may increase student Performance?

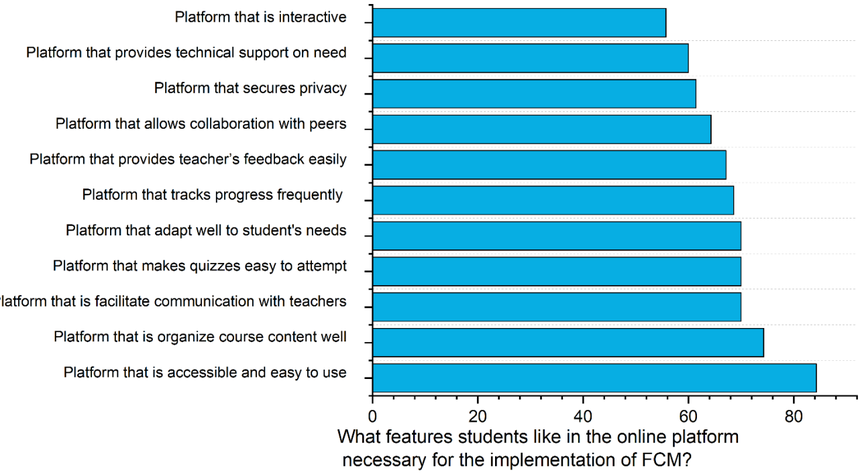


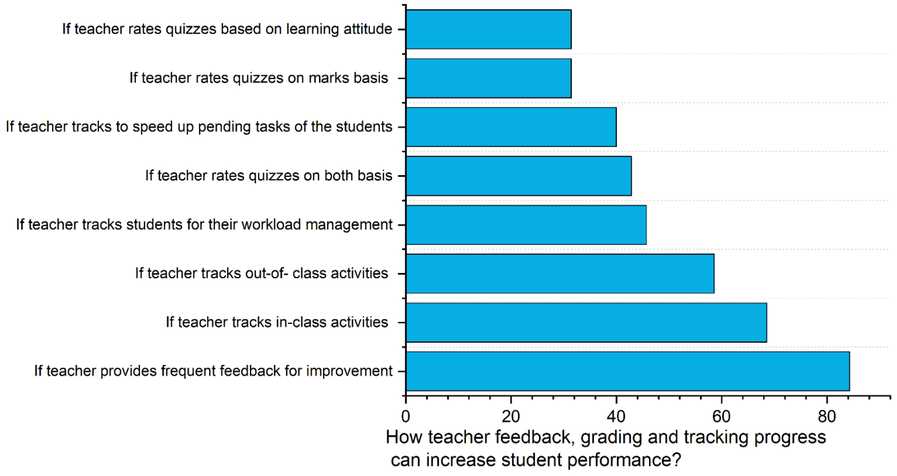
FCM features Kazakhstan (d)

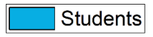




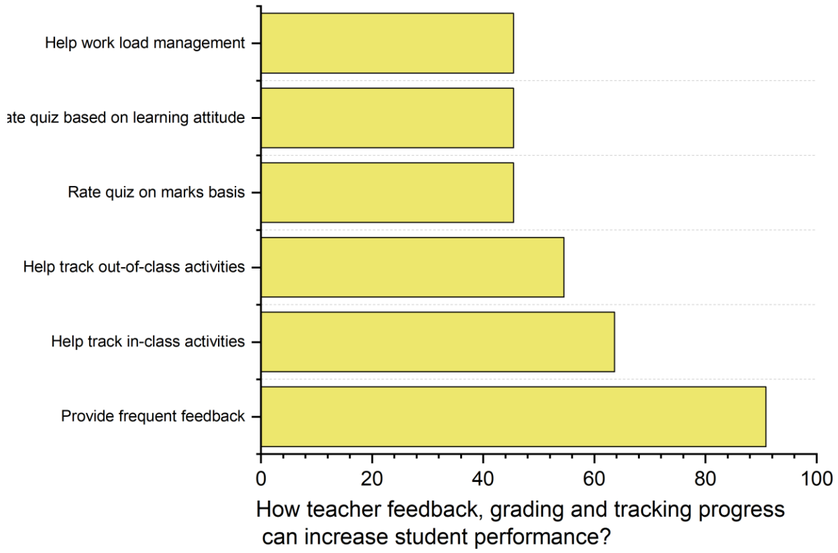




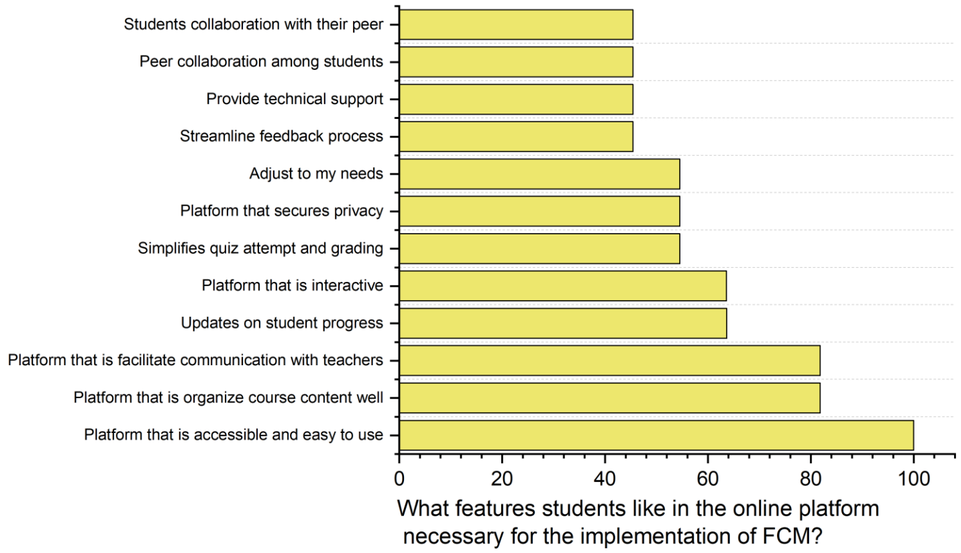




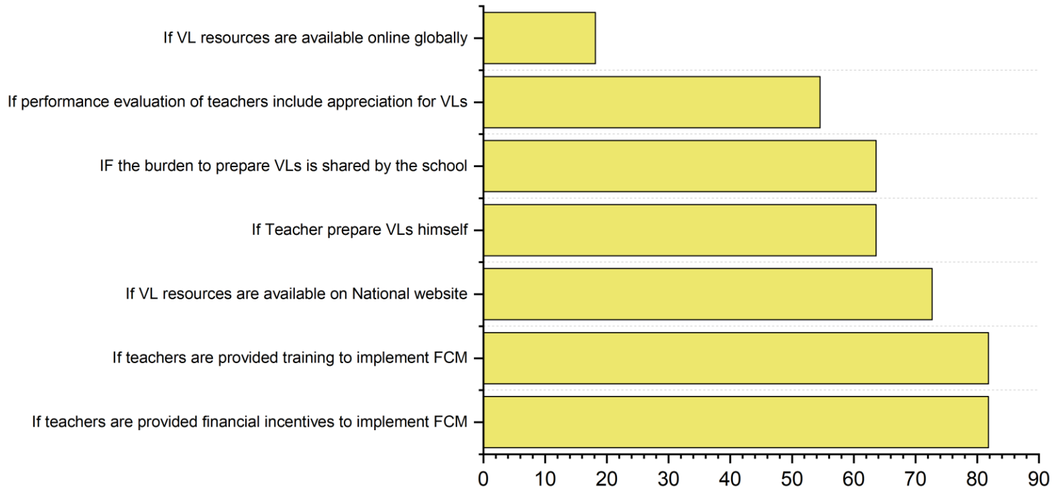
FCM features Kazakhstan (Teachers)



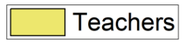
How teacher feedback, grading and tracking progress can increase student performance?



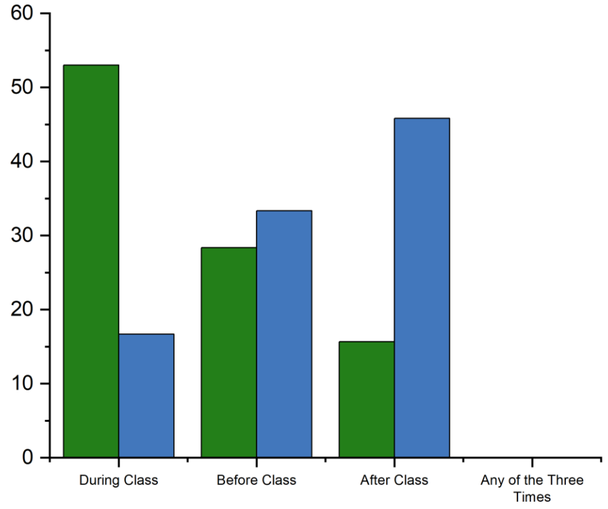
What features students like in the online platform necessary for the implementation of FCM?



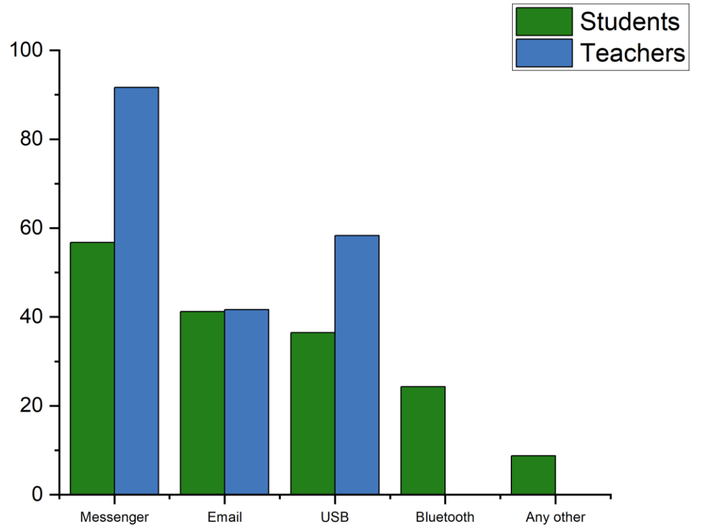
What factors will motivate the teachers to implement FCM?



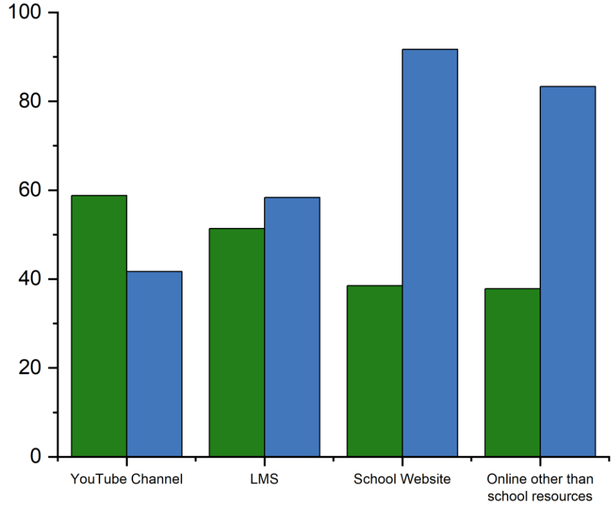
FCM features Pakistan(a)



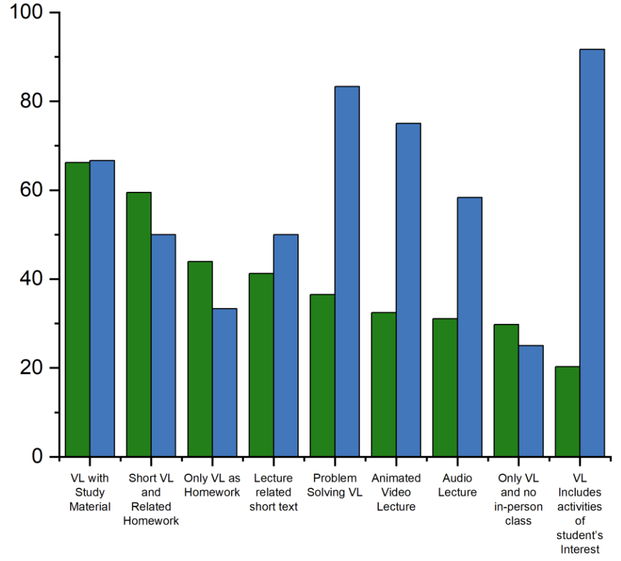
When VLs should be Delivered?



Which sharing tool students prefer in a flipped class room method?

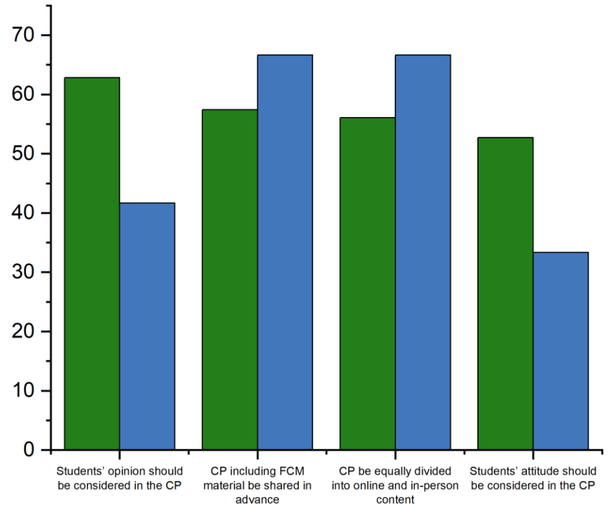


Where VLs should be available?

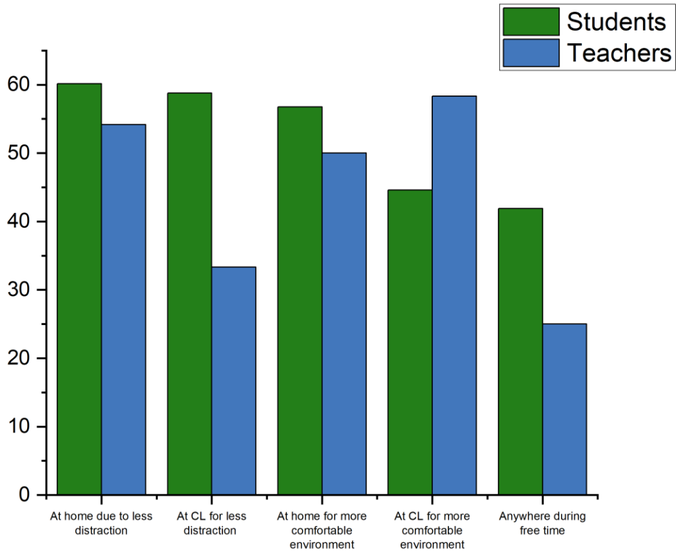


How and with what other material students prefer VLs to be shared?

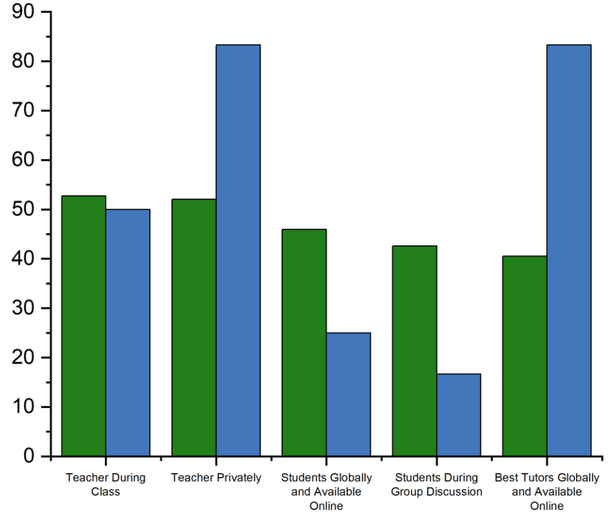
FCM features Pakistan(b)



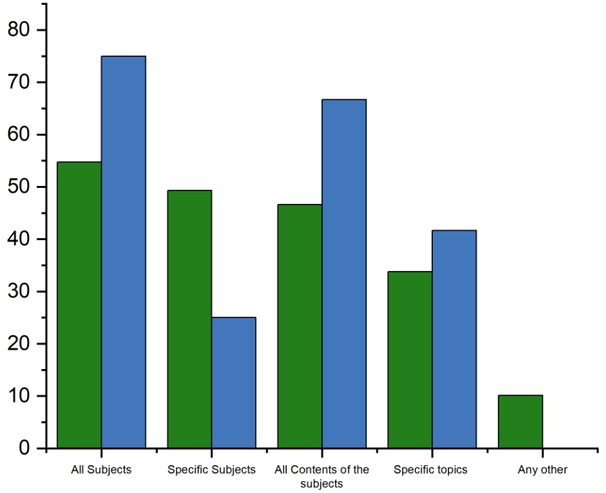
How VLs or FCM be integrated and shared with the course plan to increase student's interest and engagement?



Where Students prefer to watch VLs?

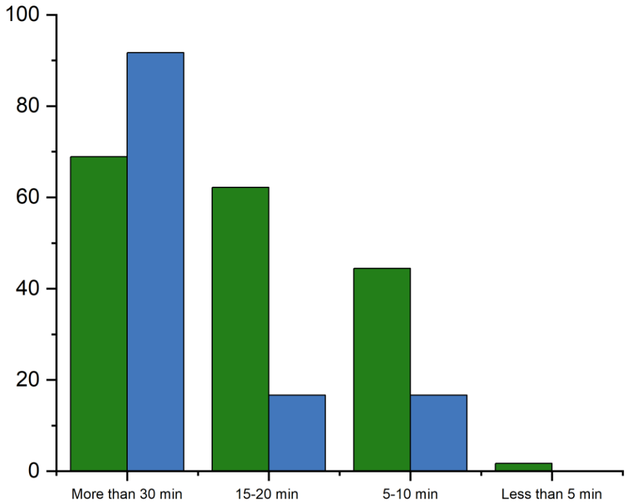


Who should record the Video Lecture?



What Content VLs must cover?

FCM features Pakistan(c)



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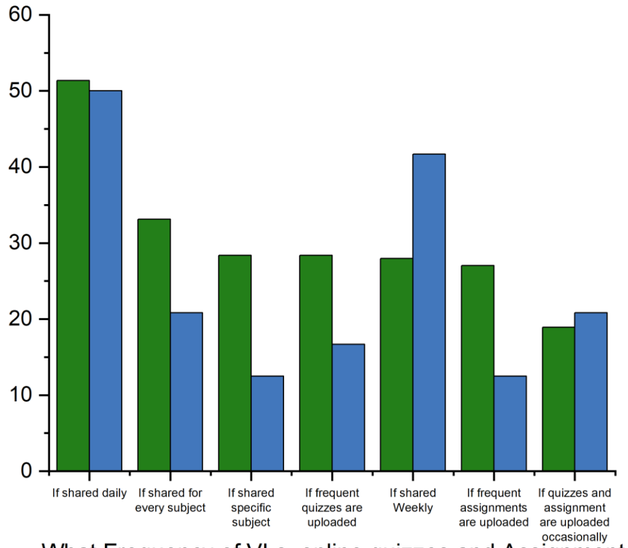

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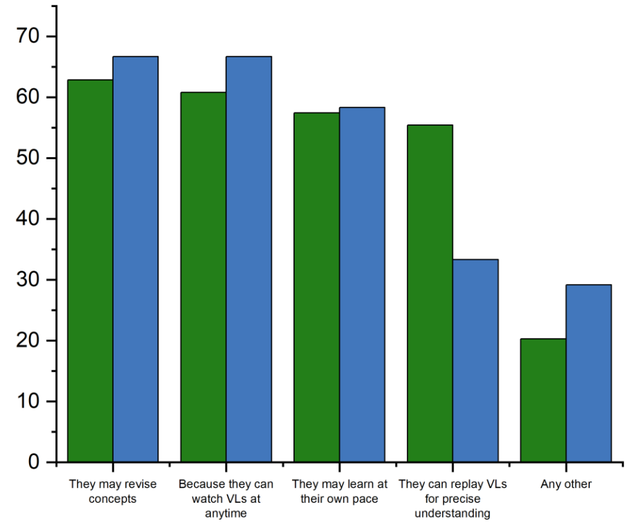
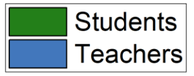
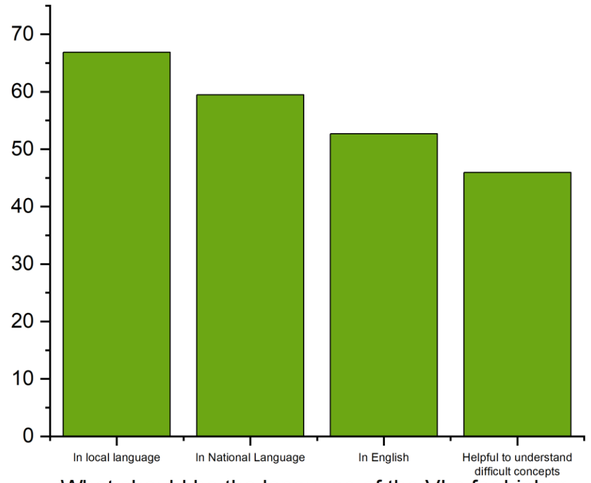


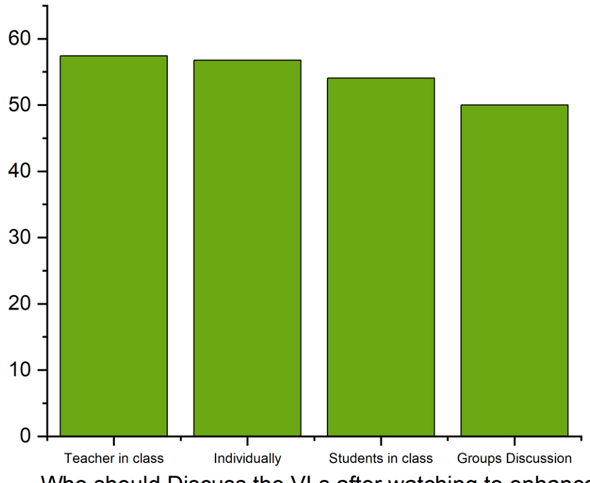
How VLs may increase student Performance?



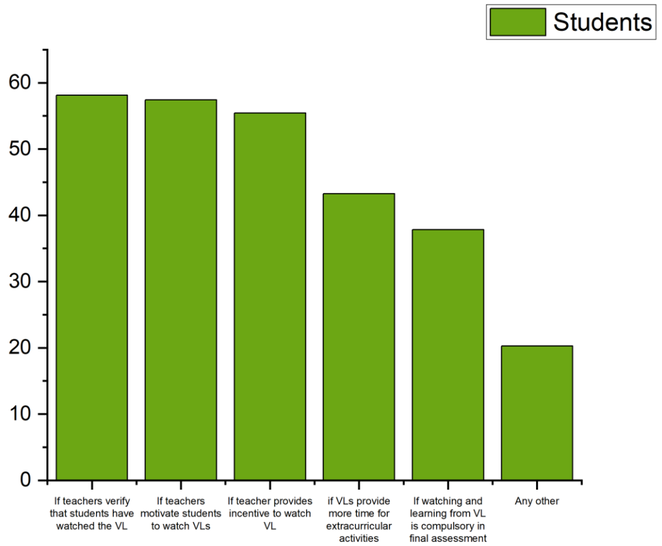
FCM features Pakistan(d)



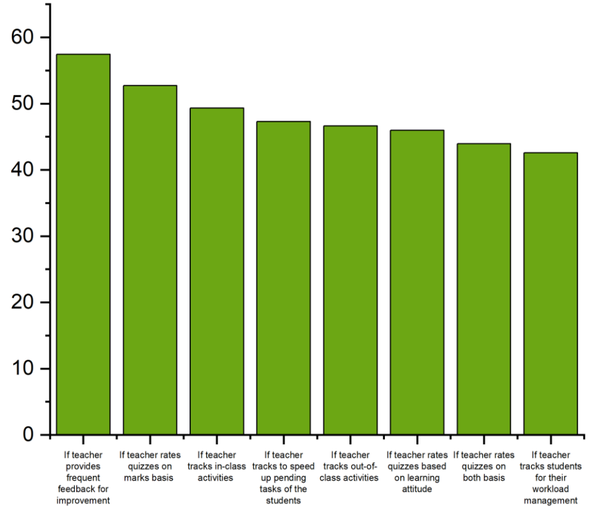
What should be the language of the VLs for higher student learning, engagement and motivation?



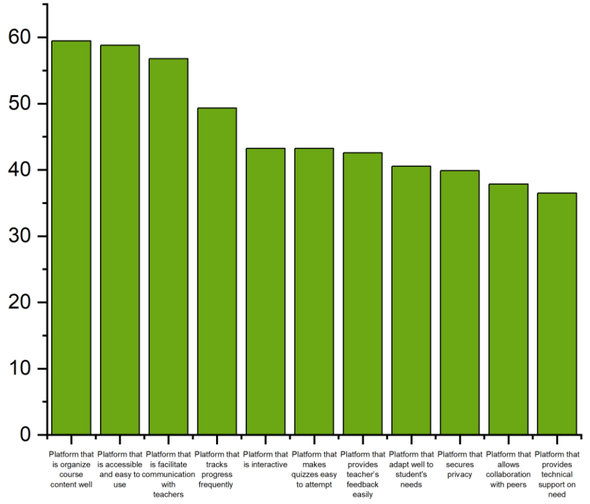
Who should Discuss the VLs after watching to enhance student learning, engagement and motivation?



What Teacher should do to increase student motivation into watching and learning from VLs?

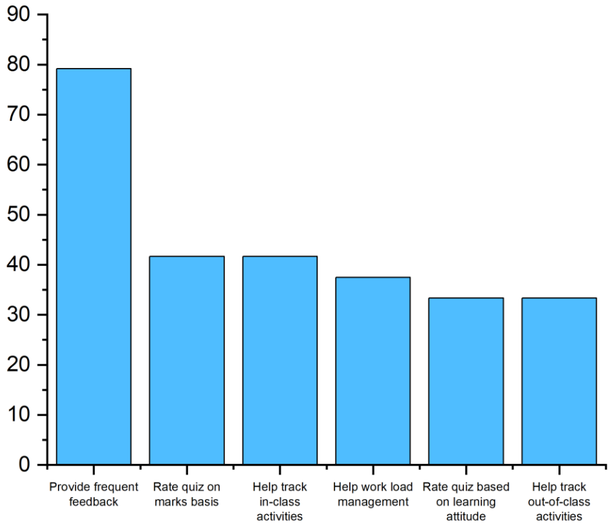


How teacher feedback, grading and tracking progress can increase student performance?



What features students like in the online platform necessary for the implementation of FCM?

FCM features Pakistan(Teachers)



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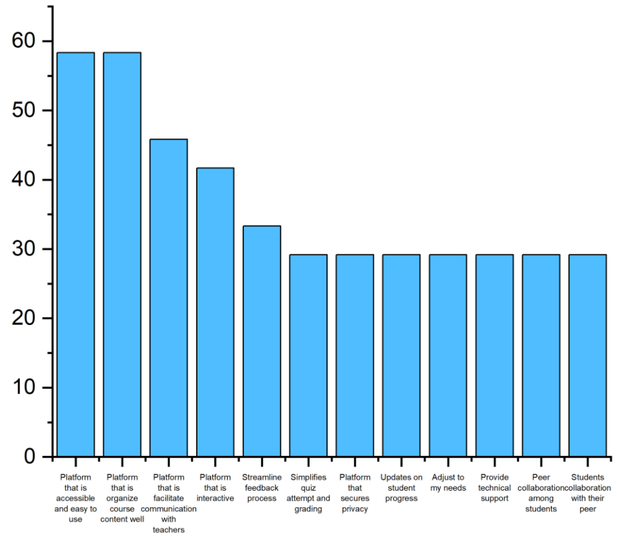

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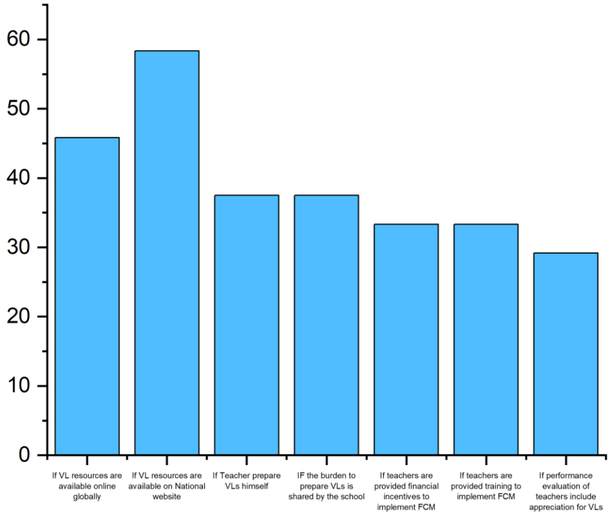

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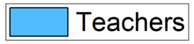
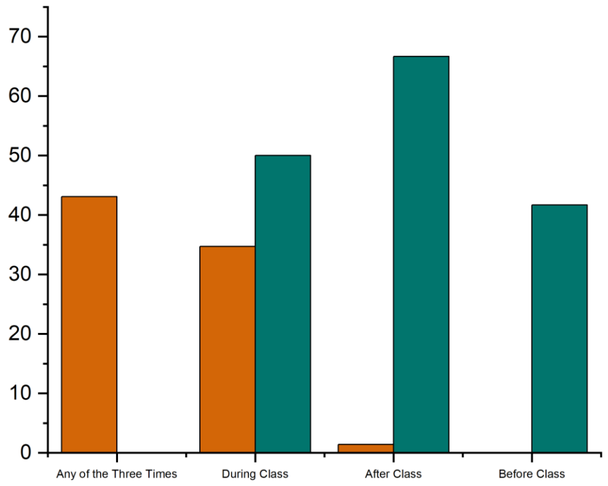
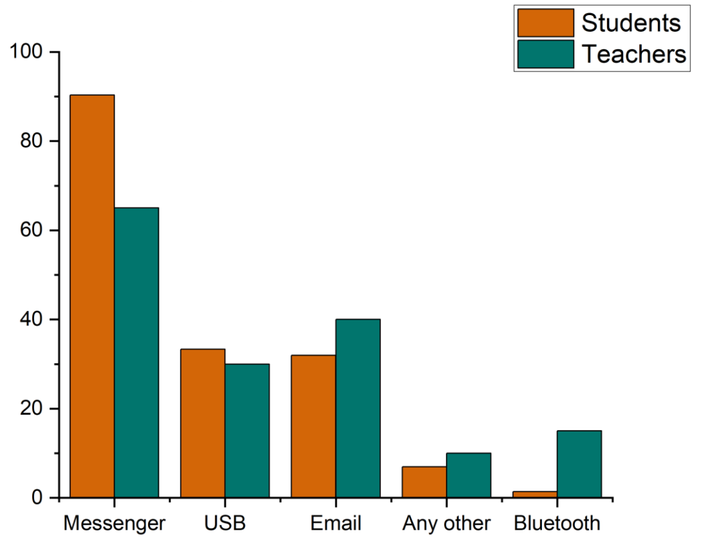


FCM features Uzbekistan (a)



When VLs should be Delivered?



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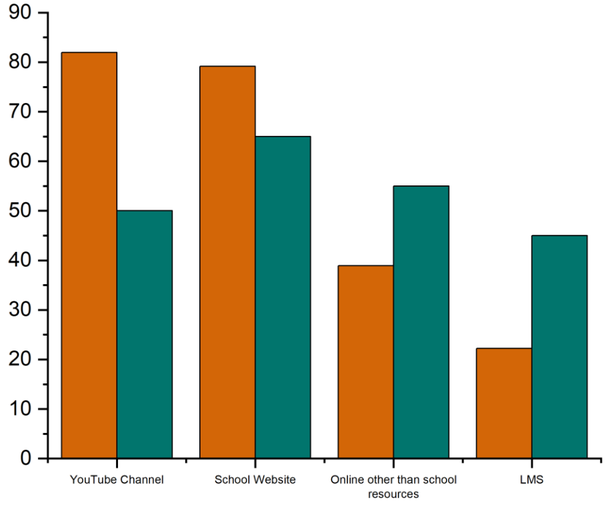
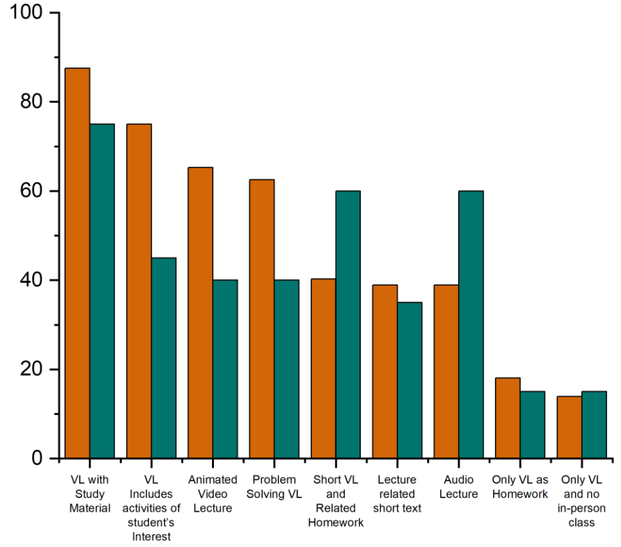
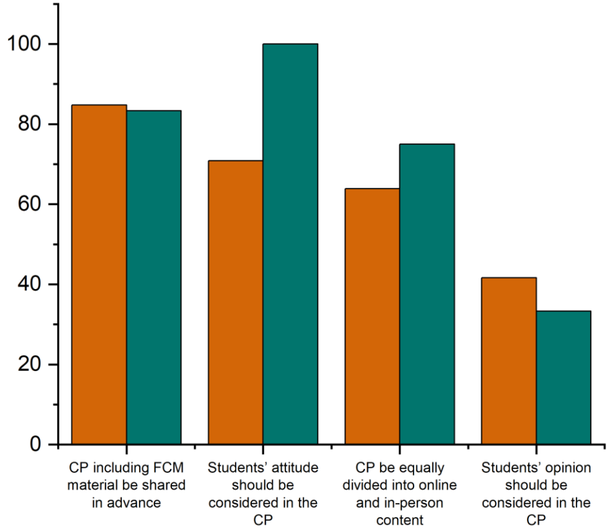


Where VLs should be available?

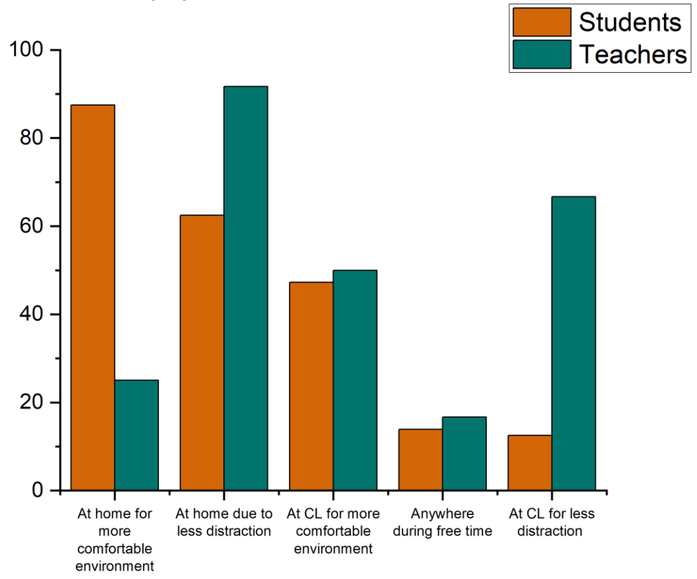


How and with what other material students prefer VLs to be shared?

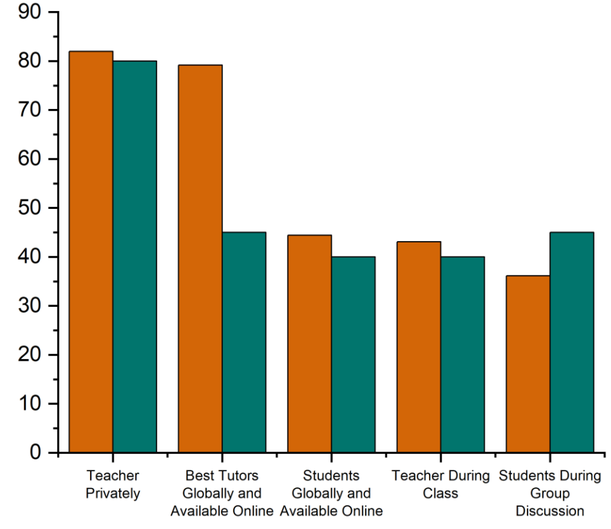
FCM features Uzbekistan (b)



How VLs or FCM be integrated and shared with the course plan to increase student's interest and engagement?



Where Students prefer to watch VLs?



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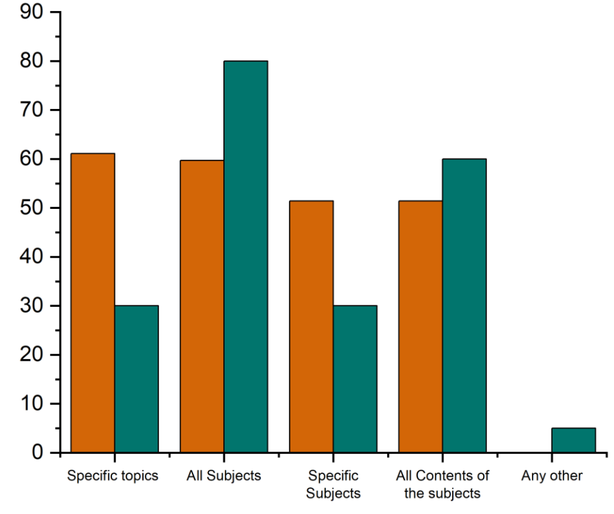
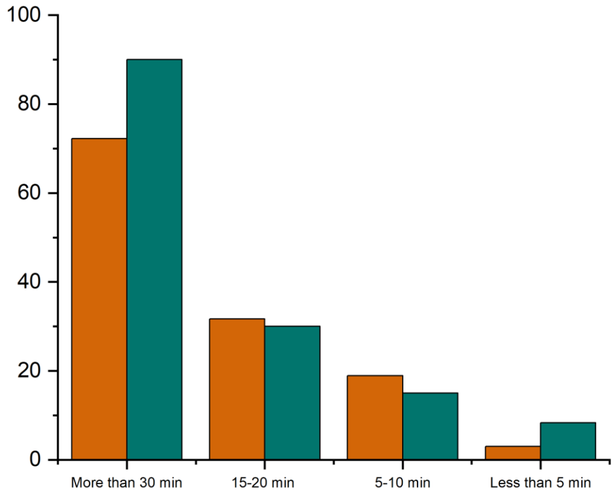


What Content VLs must cover?

FCM features Uzbekistan (c)



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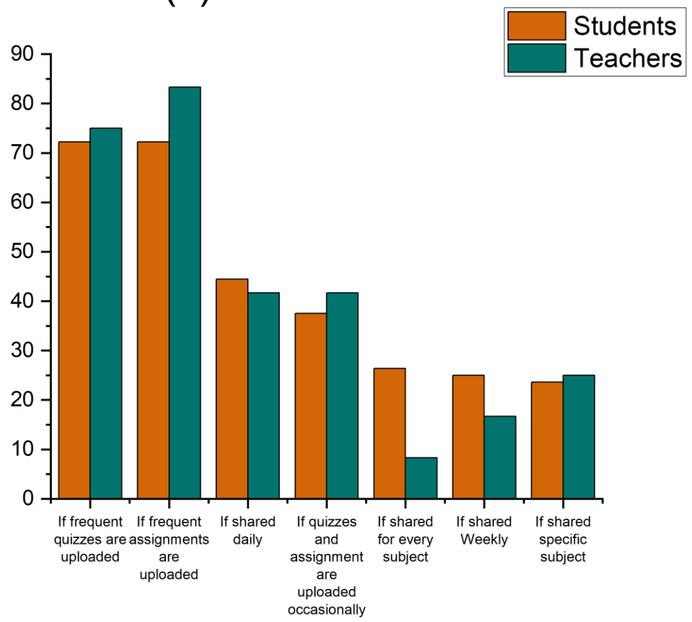

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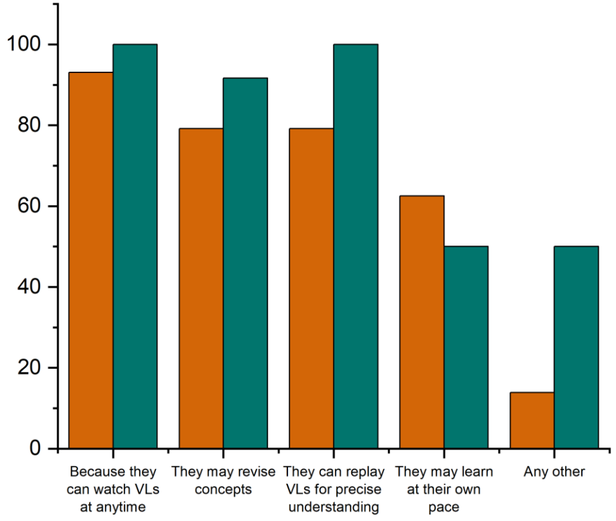
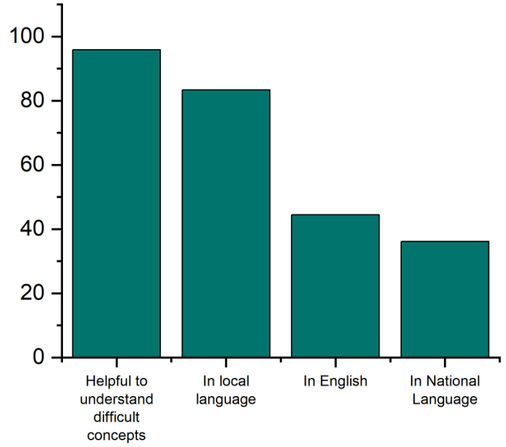
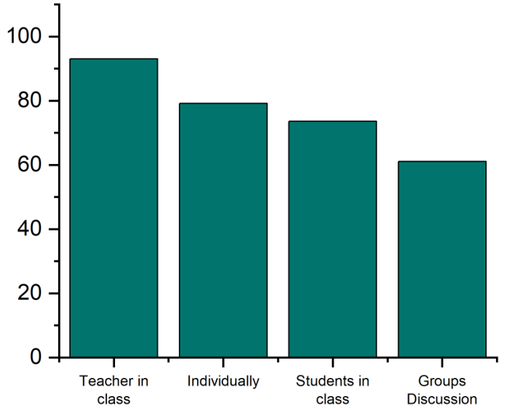


How VLs may increase student Performance?

FCM features Uzbekistan (d)

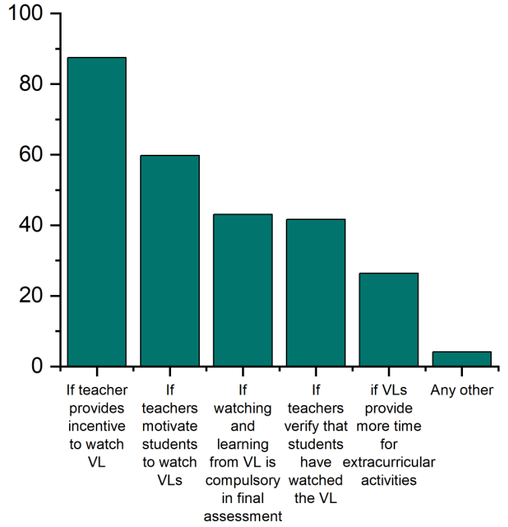


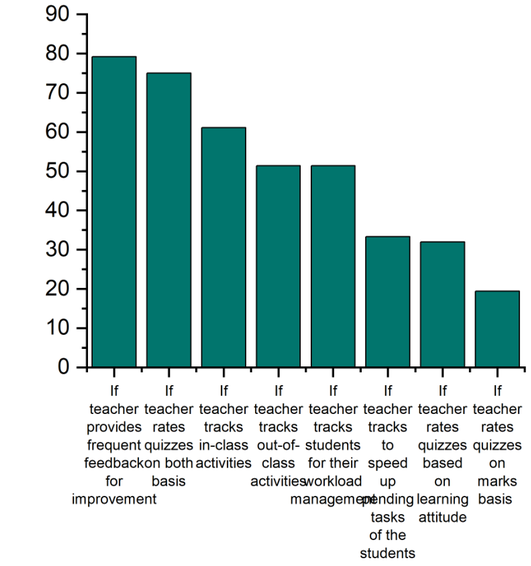
What should be the language of the VLs for higher student learning, engagement and motivation?



Who should Discuss the VLs after watching to enhance student learning, engagement and motivation?

What Teacher should do to increase student motivation into watching and learning from VLs?





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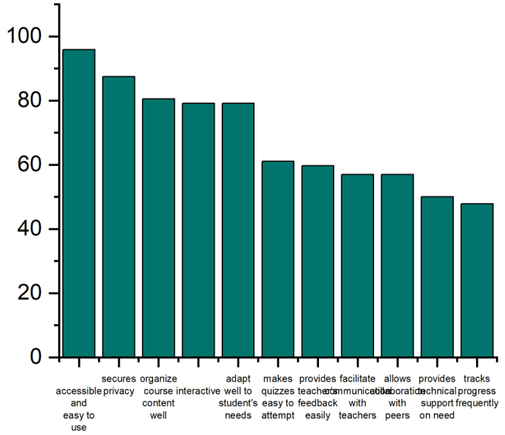
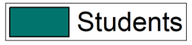
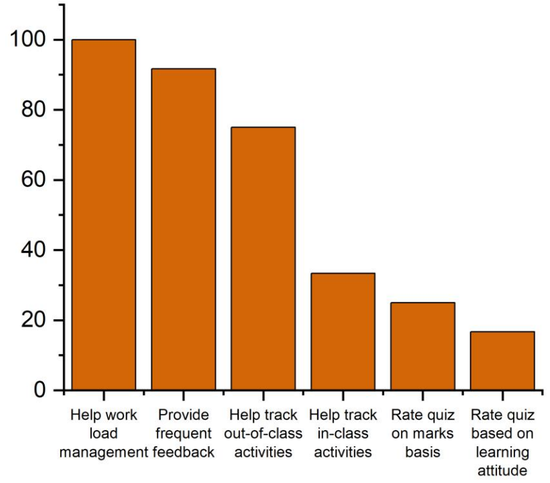


What features students like in the online platform necessary for the implementation of FCM?



FCM features Uzbekistan (Teachers)



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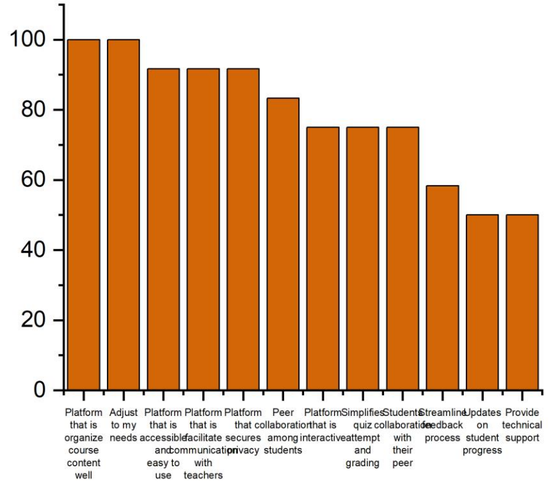

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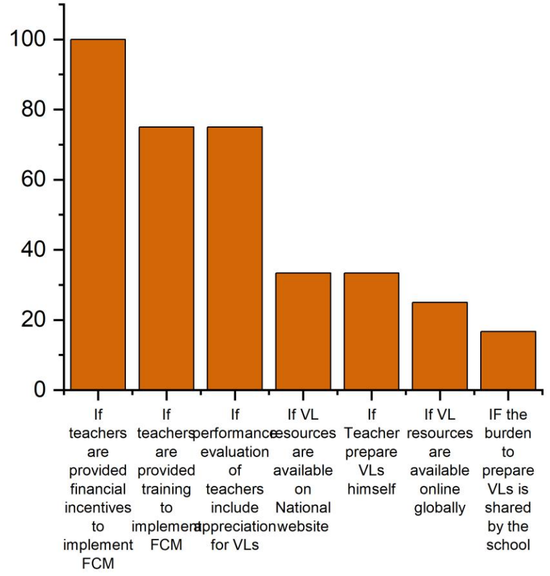

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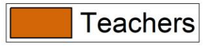
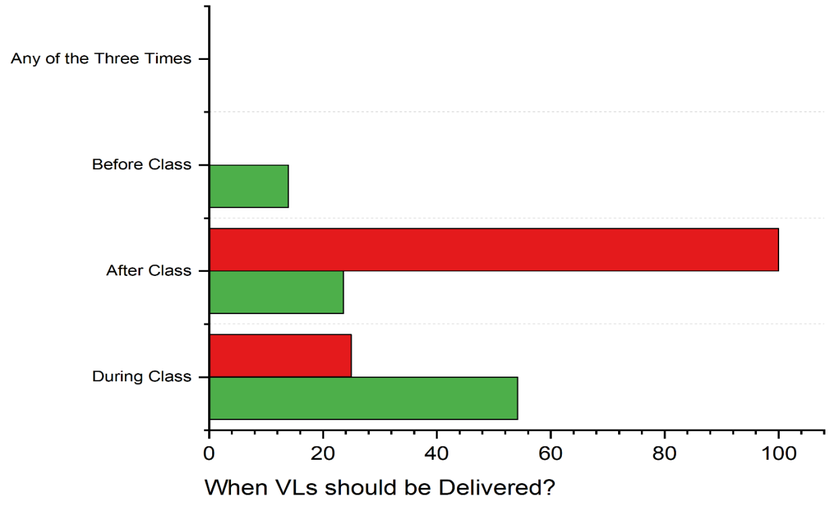


FCM features Tajikistan (a)



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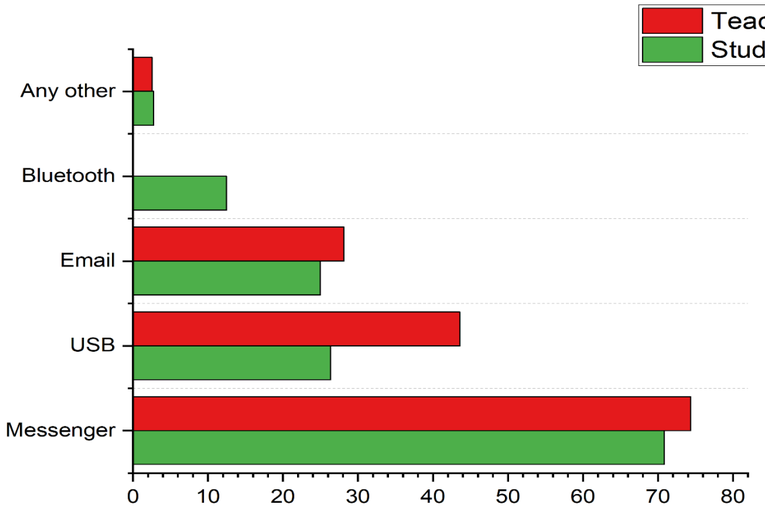

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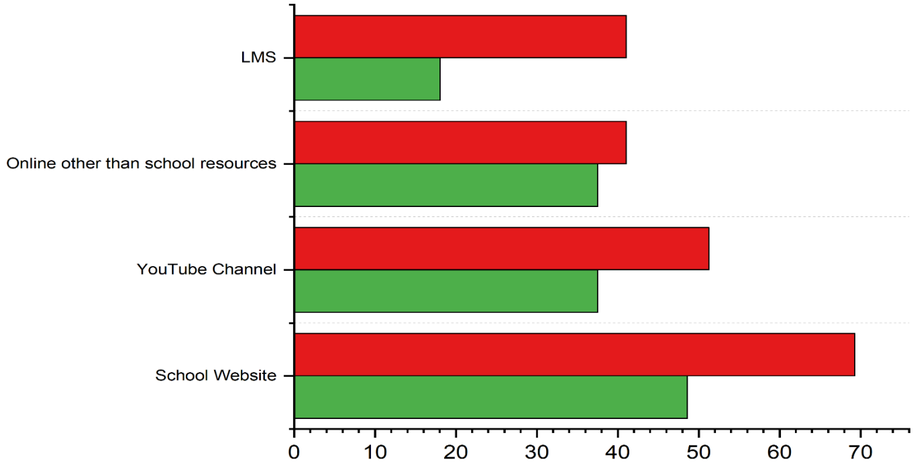

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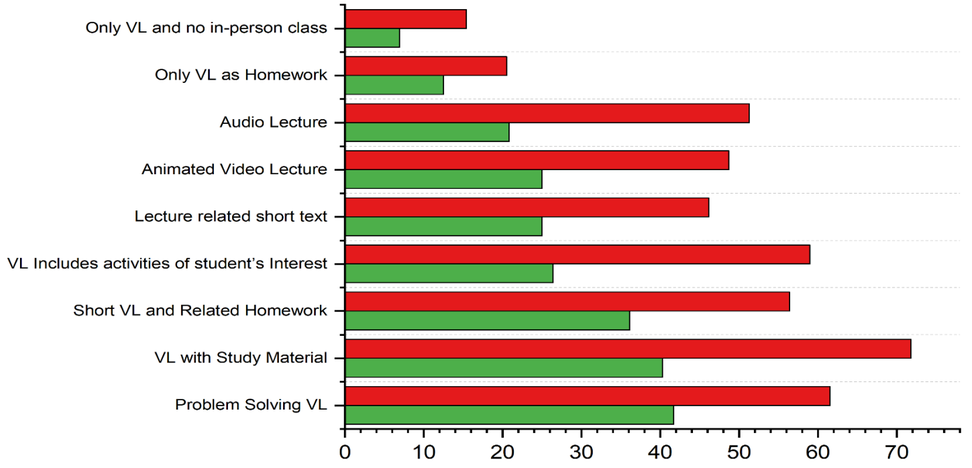
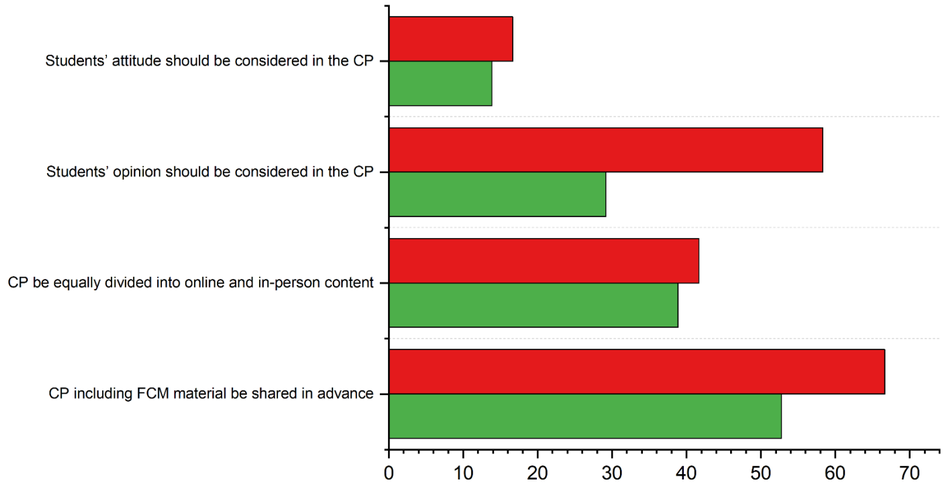
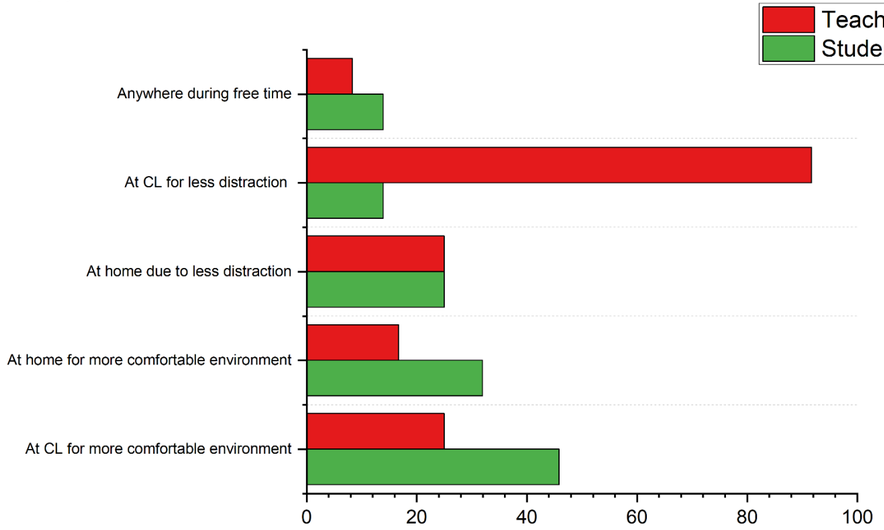


How and with what other material students prefer VLs to be shared?

FCM features Tajikistan (b)



How VLs or FCM be integrated and shared with the course plan to increase student's interest and engagement?



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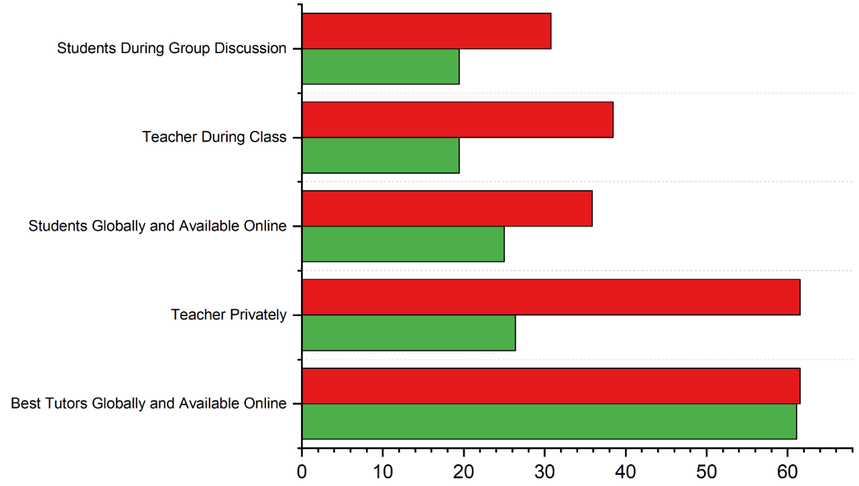

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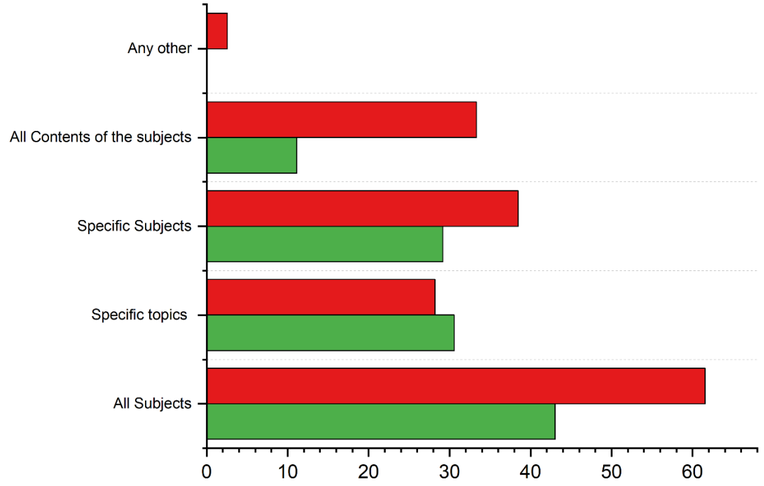
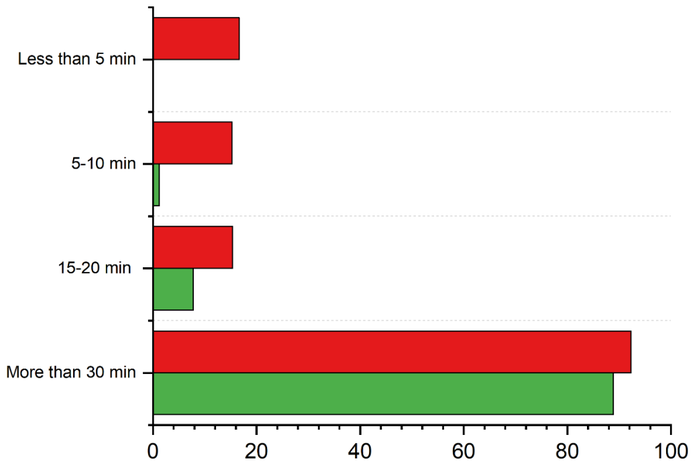


What Content VLs must cover?

FCM features Tajikistan (c)



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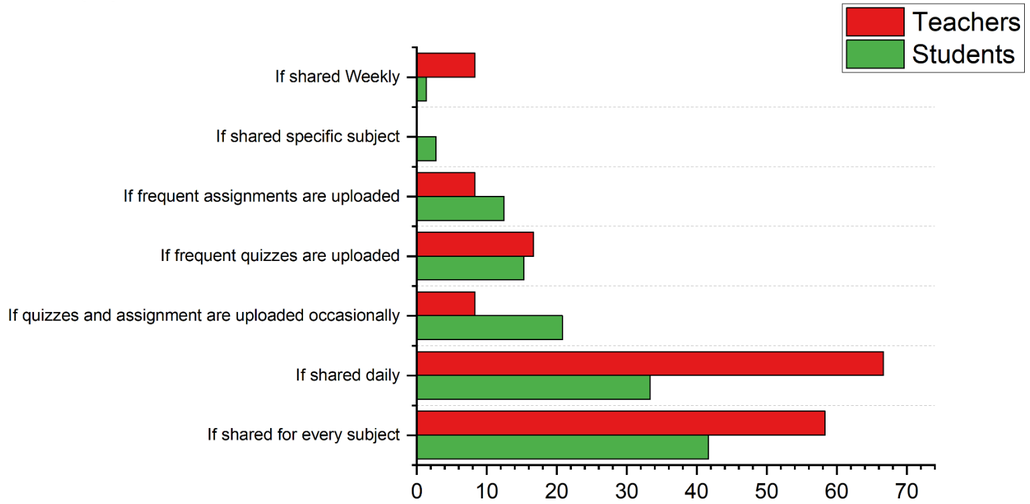

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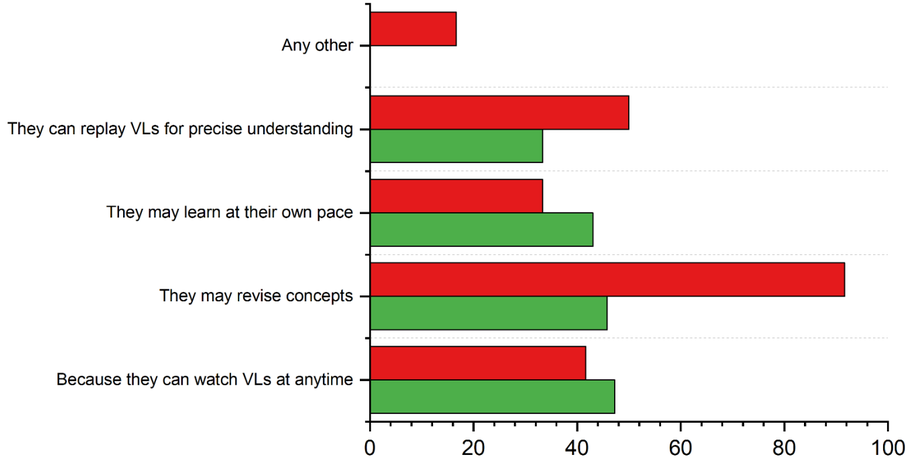
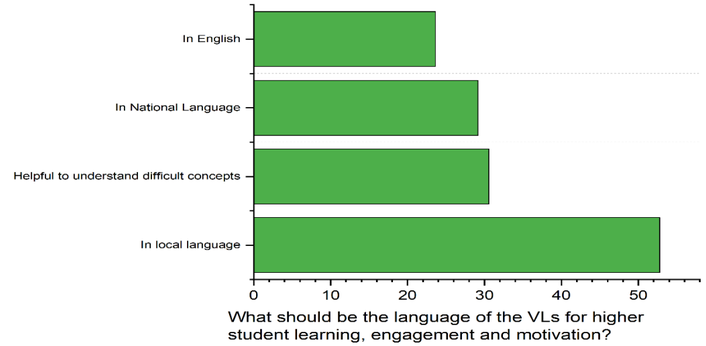
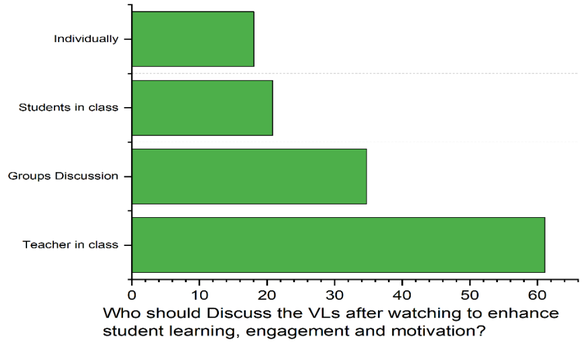


How VLs may increase student Performance?

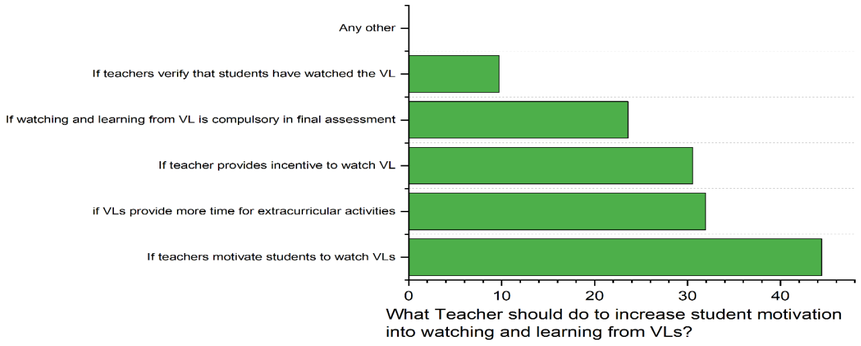
FCM features Tajikistan (d)



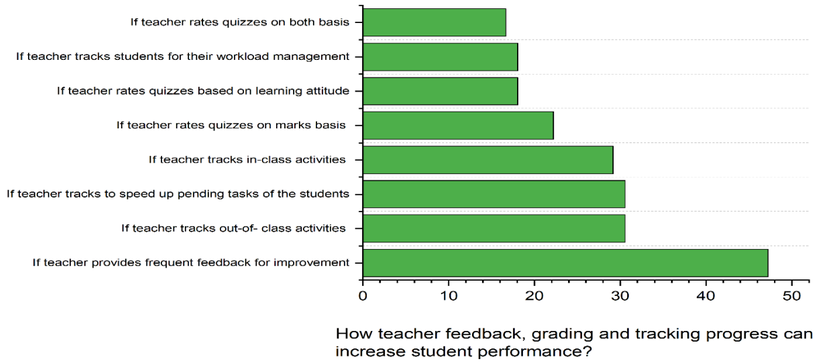
What should be the language of the VLs for higher student learning, engagement and motivation?



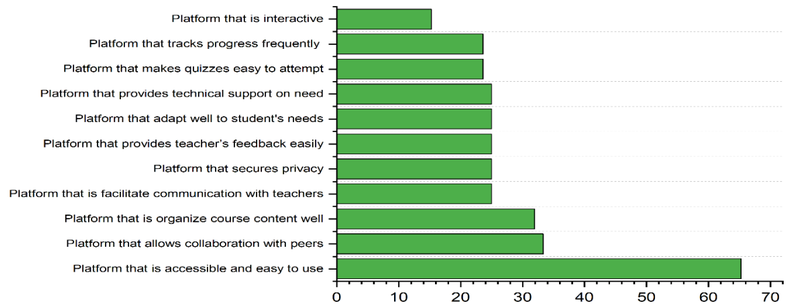
Who should Discuss the VLs after watching to enhance student learning, engagement and motivation?



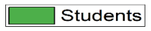
What Teacher should do to increase student motivation into watching and learning from VLs?



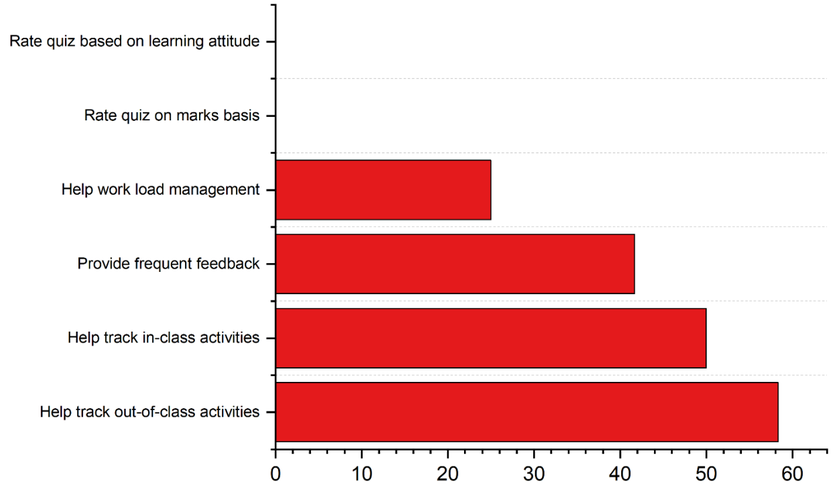
How teacher feedback, grading and tracking progress can increase student performance?



What features students like in the online platform necessary for the implementation of FCM?



FCM features Tajikistan (Teachers)



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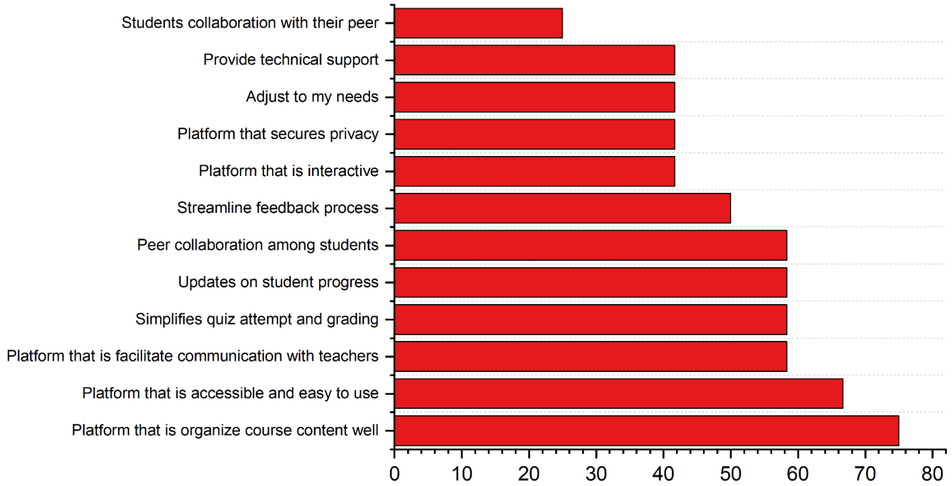

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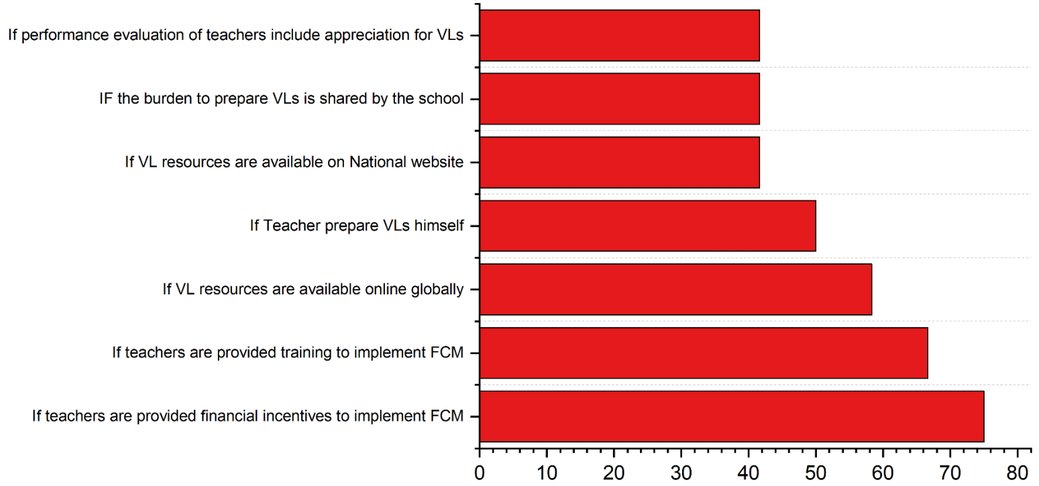
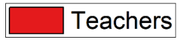


What factors will motivate the teachers to implement FCM?



PROPSED FCM FEATURES BASED ON STUDY FINDINGS

Delivery Time of VLs

- During Class
- After Class

Ideal Location to Watch VLs

- CL
- At Home

FCM Content/ Course Coverage

- All subjects
- Specific Subjects

Ideal VL Length

- From 5 to 20 Minutes

Ideal VL Language

- Local
- National,
- Helpful to understand complex subjects

VL Resource Person

- Class Teacher
- Best Tutor Globally

Frequency of VLs and Online Assessments

- Weekly or occasionally

VL Variety

- Problem-saving VLs
- Animated VLs
- VLs of student interest
- Short VLs with homework
- VLs with Study Material
- VLs explaining complex subjects
- VLs with a lecture-related short text

Online Platform and Sharing Tools

- Platforms:
  - YouTube
  - School Website
  - LMS
- Direct Communication Tools:
  - Messenger (WhatsApp, WeChat, telegram)
  - USB
  - Email

Ideal Features of Online Platform/LMS

- Accessible and easy to operate,
- Orgnises content well
- Facilitates comunication with peers and teachers
- Simplifies quiz attempt and grading
- Tracks and updates on student progress
- Adaptable to user specific needs
- Secures privacy
- Provides technical support

Course Plan under FCM

- CP including VLs should be shared in advance
- CP be divided equally into online and offline activities
- Students' attitudes and opinions should be considered in CP

Readiness of Physical, Human and Digital Resources to Adopt FCM

Physical
- Not fully ready in all countries

Human
- Need professional development via training

Digital
- Not available fully in all countries

Conclusion and Recommendations

Kazakhstan

- **Strengths**: High digital and physical infrastructure, excellent device and internet penetration (90-100%).
- **Challenges**: Need for digital libraries and Learning Management Systems (LMS).
- **Recommendations**: Leverage existing resources, provide additional training on devices and platforms, and enhance digital libraries and LMS.

Pakistan

- **Strengths**: students are familiar with platforms YouTube, MS Office, and Google Classroom.
- **Challenges**: Low device access (50-60%), insufficient digital infrastructure, high internet costs, and limited teacher training.
- **Recommendations**: Increase device and internet access, improve digital literacy, and reduce financial burdens related to online resources. Focus on teacher training and infrastructure development.

Uzbekistan

- **Strengths**: Good physical and IT resources, high device access (90-100%).
- **Challenges**: Limited infrastructure for full-scale FCM implementation, need for faculty development.
- **Recommendations**: Enhance infrastructure, expand access to digital resources, and implement robust faculty development programs.

Tajikistan

- **Strengths**: High device access (over 90%), existing use of online platforms.
- **Challenges**: Poor internet quality, lack of YouTube channels and LMS, limited use of IT devices.
- **Recommendations**: Improve internet quality, increase IT device usage, and prioritize affordable internet facilities. Expand training for students and teachers.

Specific Recommendations for Kazakhstan

i) Faculty and Student Training

Current Status: Advanced digital and physical resources, with an ideal student-teacher ratio and most teachers holding master's degrees.

Needs: Enhanced digital literacy and specialized training for faculty and students. Current training (3-5 sessions/year) needs to be expanded to include practical sessions on specific devices and applications.

Recommendation: Integrate designated training slots into the academic calendar. Provide initial training before FCM launch and ongoing refresher courses.

ii) Digital Content Development in Local Language

Current Status: Use of national platforms like bilim land, but content in local languages is limited.

Needs: Development of digital textbooks, interactive lessons, and multimedia content in local languages. Streamline translation processes for online resources.

Recommendation: Collaborate with educational content providers to adapt or develop digital curricula in local languages. Ensure assessments and online quizzes align with Kazakhstan's educational standards.

Specific Recommendations for Kazakhstan

iii) Platform Adaptability and Uniformity

- Current Status: Multiple platforms used, including YouTube, Bilimland.kz, Kundelik.kz
- Needs: Adoption of a comprehensive LMS that supports Kazakh, Russian, and other local languages. Consider creating a school website for comprehensive BL resources.
- Recommendation: Develop or acquire a sophisticated LMS that meets identified criteria and supports diverse languages. Implement a school website for instructional materials and assessment tools.

iv) Digital Infrastructure and Internet Connectivity

- Current Status: Well-established digital infrastructure, but some dissatisfaction with internet quality and IT infrastructure.
- Needs: Strengthen digital resources and improve internet quality for equitable access.
- Recommendation: Enhance digital infrastructure and internet connectivity to ensure all students and educators have equal access.

v) Budget Allocation for Training and Infrastructure

- Current Status: Established infrastructure and government support, but concerns about insufficient funding.
- Needs: Budget for ongoing training, maintenance of IT equipment, and development of digital content.
- Recommendation: Increase budget allocations for faculty and student training, IT equipment updates, and securing digital content and platforms.

Specific Recommendations for Pakistan

i) Development of Digital/IT Infrastructure

- Current Status: Poor IT infrastructure, overcrowded schools, low availability of computers, and limited multimedia resources.
- Needs: Significant investment in digital equipment and infrastructure. All classrooms need computers, projectors, or tablets. Schools should be equipped to provide technology access to all students.
- Recommendation: Prioritize budget allocation for upgrading IT infrastructure, including computers, multimedia resources, and digital equipment to support a robust learning environment.

ii) Reliable and Low-Cost Internet Connectivity

- Current Status: Lowest internet penetration rate, high costs, minimal BB installation.
- Needs: Improved and affordable internet access. Existing connectivity is inadequate.
- Recommendation: Increase govt funding for subsidized internet bundles for schools and students. Collaborate with telecom companies Ensure consistent, high-quality internet

iii) **Student Support for Tablets/Smartphones/iPads**

- **Current Status**: Low device access (50-60%) and financial burden on families.
- **Needs**: Subsidized or free devices for students to facilitate access to online resources.
- **Recommendation**: Expand the PM laptop scheme to include tablets or smartphones for all students. Focus on low-cost devices to avoid financial strain on families..

iv) Training for Teachers and Students

- Current Status: Low digital literacy and insufficient training for both students and teachers.
- Needs: Comprehensive training programs for digital literacy and effective use of smart devices and online platforms.
- Recommendation: Implement mandatory training workshops and refresher courses for teachers and students. Ensure training covers device usage, online platforms, and digital literacy skills.

v) Digital Curriculum Development or Adaptation

- Current Status: Limited digital content in local languages; some available in Urdu.
- Needs: Development of digital content in multiple local languages and adaptation of online quizzes and assessments.
- Recommendation: Collaborate with content providers to develop or adapt digital curricula in local languages. Simplify translation processes and create or modify online assessments to match regional educational needs.

Specific Recommendations for Pakistan

vi) Platform Availability and Compatibility

- Current Status: Lack of a unified educational platform; reliance on YouTube for content.
- Needs: A comprehensive LMS that supports local languages and integrates educational resources and assessments.
- Recommendation: Develop or adapt a robust LMS with features for content management, assessments, and user engagement. Consider creating a centralized school website for educational resources and assessments.

vii) Time Management, Teacher's Assistance, and Incentives

- Current Status: High student-teacher ratio, financial strain on teachers, and overburdened educators.
- Needs: Efficient time management for teachers and students, financial incentives to manage workload.
- Recommendation: Implement strategies to manage teachers' workloads and provide financial incentives or promotions. Centralize access to digital content to streamline operations and reduce teacher burden.

viii) Technical Support

- Current Status: Need for specialized IT support in schools.
- Needs: On-site IT specialists to handle technical issues and maintenance.
- Recommendation: Hire IT experts for each school or education department to manage technical problems and equipment maintenance. Allocate budget for these positions.

ix) Financial Resources

- Current Status: Significant initial setup costs for IT infrastructure and ongoing expenses.
- Needs: Funding for equipment, digital content development, and ongoing maintenance.
- Recommendation: Seek funding from government or international donors to cover initial setup costs. Explore revenue-generating ventures or partnerships to support ongoing expenses for technology and professional development.

Specific Recommendations for Uzbekistan

Reliable and Low-Cost Internet Connectivity and Sufficient Bandwidth

Current Status: High internet connectivity rates, but broadband installation in schools and homes needs improvement. Cost is a concern for some families, especially in remote areas.

Needs: Enhanced quality and availability of internet across all regions, with a focus on subsidized bundles for students and schools.

Recommendation: Implement national-level initiatives to improve broadband access and quality. Collaborate with telecom companies to offer special subsidized internet bundles, ensuring reliable and affordable connectivity for educational institutions and students.

ii) Training for Teachers and Students

Current Status: Low digital literacy and insufficient IT training for teachers. Teachers report a lack of qualified staff for FCM implementation.

Needs: Comprehensive faculty development programs and mandatory training sessions for both teachers and students.

Recommendation: Launch faculty training programs focusing on digital literacy and FCM implementation. Conduct regular refresher courses and provide instructional materials to help both educators and students navigate new technologies effectively.

iii) Digital Curriculum Development or Adaptation

Current Status: Digital content is available in Uzbek and Russian, but translation and adaptation are needed.

Needs: Development of digital content in local languages and adaptation of online assessments.

Recommendation: Collaborate with content providers to develop or modify digital curricula in Uzbek and Russian. Simplify the translation process for digital resources and create or adapt online quizzes and assessments to meet local educational needs.

Specific Recommendations for Uzbekistan

iv) Platform Availability and Compatibility

Current Status: Use of multiple platforms like YouTube, MS Office, and educational sites. Talim.Uz is underutilized.

Needs: A unified LMS that supports local languages and integrates various educational resources.

Recommendation: Develop or adapt a single, comprehensive LMS with features tailored to Uzbek users. Ensure the platform supports local languages and provides easy access to educational resources and assessments. Alternatively, create a school website to offer blended learning resources and information, with minimal training required for effective use.

v) Development of Digital/IT Infrastructure

Current Status: Existing IT infrastructure is good, but improvements are needed to ensure 100% access. Technical assistance is available but may need enhancement.

Needs: Upgrade and complete IT infrastructure, and provide additional technical support.

Recommendation: Conduct a needs assessment to identify and address gaps in IT resources. Train IT staff on new developments and ensure technical assistance is readily available to support daily operations.

vi) Financial Resources

Current Status: Initial setup costs are manageable due to existing IT infrastructure, but ongoing costs for maintenance and updates are a concern.

Needs: Increased funding for initial setup, ongoing maintenance, and professional development.

Recommendation: Increase government funding to support IT infrastructure improvements and ongoing costs. Ensure that schools receive adequate financial resources to maintain and update technology and provide professional development opportunities for educators.

Specific Recommendations for Tajikistan

i) Development of Digital/IT Infrastructure

- **Current Status:** While schools have reported sufficient IT resources, the actual accessibility and usage by students and teachers are limited. Computer labs are underused, and some schools lack a computer lab altogether.
- **Needs:** Conduct a thorough needs assessment to evaluate the actual state of IT infrastructure in schools. Upgrade resources to ensure each student has daily access to at least one device.
- **Recommendation:** Establish a rotating schedule to maximize the use of existing IT resources, such as smartboards and multimedia systems. Invest in upgrading schools with insufficient resources and ensure efficient utilization of available equipment to provide 100% access to students and teachers.

ii) Reliable and Low-Cost Internet Connectivity and Sufficient Bandwidth

- **Current Status:** Many users rely on mobile data for connectivity. Schools have broadband (BB) but report issues with internet quality and cost.
- **Needs:** Improve internet quality and reduce costs for both schools and households. Ensure reliable and affordable broadband access.
- **Recommendation:** Collaborate with telecom companies to provide subsidized internet bundles for students and schools. Work on reducing the cost of broadband installation for homes and schools to enhance access to high-quality internet.

Specific Recommendations for Tajikistan

iii) Training for Teachers and Students

Current Status: Device access and digital literacy are relatively high, but there is a need for more training on using technology for educational purposes. Teachers report a lack of IT training and qualified staff for implementing FCM.

Needs: Expand faculty development programs and provide more comprehensive training for both teachers and students.

Recommendation: Launch and scale up faculty development programs with mandatory IT training before FCM implementation. Offer regular refresher courses and provide guidelines and instructional materials for students to navigate new technologies.

iv) Digital Curriculum Development or Adaptation

Current Status: Some digital content is available in Tajik, but there is a need for more uniform and comprehensive digital resources.

Needs: Develop and adapt digital content in local languages (Tajik and Russian) to support a wide range of educational needs.

Recommendation: Collaborate with educational content providers to create or modify digital curricula in Tajik and Russian. Simplify translation processes and develop online quizzes, tests, and assignment systems tailored to local learning needs.

Specific Recommendations for Tajikistan

v) Platform Availability and Compatibility

Current Status: Existing platforms like Kitobdust and YouTube are used, but they lack comprehensive features for content management and assessment.

Needs: Develop or adapt a unified Learning Management System (LMS) that supports local languages and integrates educational resources.

Recommendation: Create or adapt a web-based educational platform with features for content management, assessments, and progress monitoring. Ensure the platform supports Tajik and Russian languages and integrate training modules into the national academic plan. Consider developing a school website to offer blended learning resources and information.

vi) Technical Support

Current Status: IT specialists are available in only half of the surveyed schools, leading to inadequate technical support in other schools.

Needs: Increase the availability of IT specialists to handle technical issues and maintain equipment.

Recommendation: Hire IT specialists for all schools and allocate a budget for their support. Ensure these specialists are well-trained in network systems, hardware, and troubleshooting to minimize disruptions.

vii) Financial Resources

Current Status: Initial setup costs are manageable due to existing IT infrastructure. Ongoing costs for maintenance, professional development, and updates are a concern.

Needs: Improve funding for schools to strengthen IT resources and cover ongoing expenses.

Recommendation: Increase government funding to support the upkeep and modernization of technology, provide professional development for educators, and ensure that online resources remain relevant. Address concerns from schools regarding insufficient support by enhancing financial resources.

Common Recommendations

i) Minimum ICT Investments Needed for Blended Learning to Take Place
Ensure basic IT infrastructure is in place, including computers or TVs for digital content display. Implement uninterruptible power supplies (UPS) where electricity is unreliable. Store educational content on local servers to ensure access even with intermittent internet connections.

ii) FCM Integration into the Course Plan
Redesign course plans to incorporate both online and offline activities. Plan digital content, assessments, and practical sessions in advance. Share course plans with students early to allow preparation and balance workload. Provide training for teachers on preparing course plans and integrating FCM, ensuring access to necessary digital content and platforms.

iii) Time Management, Teacher's Assistance, and Incentives for Workload Management
Use user-friendly Learning Management Systems (LMS) to support teachers. Manage teacher workload by integrating digital content into course plans and providing administrative support. Avoid requiring teachers to create digital content alone; instead, use centralized content to ease the burden. Consider financial incentives if budget allows to maintain motivation.

iv) Communication Tools
Utilize cost-effective communication tools for sharing digital content and collaborating. Provide subsidized internet bundles for educational use. Choose platforms based on cost, ease of use, and stakeholder preferences.

v) Difficulties in Pacing with Rapid Technological Change and Student Motivation
Design FCM with flexibility and focus on core technology skills applicable across platforms. Include strategies to manage information overload and promote balanced screen use. Ensure the model supports diverse learning needs to maintain student engagement.

Common Recommendations

vi) Digital Library

Implement measures to provide digital library access to all schools. This will support access to a wide range of national and international educational resources.

vii) Power Backup

Invest in power backup systems to ensure uninterrupted learning, especially in regions with frequent outages.

viii) Risk Assessment of Using Publicly Available Platforms

Develop guidelines for the responsible use of public platforms. Educate teachers on data security and privacy. Ensure compliance with data protection laws and provide training on safeguarding sensitive information.

ix) Stakeholders' Role

•**School Administration**:

- Manage resources for FCM implementation.
- Communicate deficiencies and seek additional resources.
- Monitor FCM integration and gather feedback to address challenges.

•**Governments / Education Authorities / Ministries**:

- Reform national education policy to include BL techniques.
- Provide financial, technical, and human resources for BL implementation.
- Guide policy-making based on real-world needs and monitor FCM progress.

•**Parents**:

- Support the adoption of BL strategies by providing IT gadgets and internet access.
- Participate in meetings to understand FCM and their role in supporting their child's learning.

Recommendations for IsDB

1.Promote Blended Learning Models

1.Fund and adapt local blended learning projects in Kazakhstan, Pakistan, Tajikistan, and Uzbekistan.

2.Strengthen Digital Infrastructure

1.Provide grants for upgrading school infrastructure, focusing on Pakistan and Tajikistan.

3.Improve Internet Access

1.Support initiatives to enhance connectivity and reduce costs, partnering with local ISPs.

4.Enhance Teacher Training

1.Fund professional development tailored to local needs and blended learning methods.

5.Address Socio-Economic Barriers

1.Implement scholarships and subsidies for educational resources.

6.Foster Regional Collaboration

1.Organize regional workshops and forums for knowledge exchange.

7.Monitor and Evaluate

1.Develop tracking tools and fund research to evaluate FCM impact and digital infrastructure.

Scale Up

Additional Training: Provide further professional development for educators.

Financial Resources: Secure funding for technological resources and tools.

Student Access: Ensure all students have access to necessary remote learning tools.

Feedback Collection: Gather and use feedback from teachers and students for continuous improvement.

Addressing these needs and limitations will enable successful implementation of FCM across all grade levels and subjects.

THANKS