

Assessing the B.ED. Pre-Service Teachers' Knowledge, Skills and Attitude toward Integrating Web 2.0 Technologies in their Prospective Teaching Careers

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ABSTRACT

Web 2.0 technologies are becoming more crucial for improving teaching and learning interactivity. Blogs, wikis, Google applications, and educational online portals are technologies that may assist educators in rendering their classes more interactive and engaging, therefore shifting students' focus towards active learning rather than passive participation. Nonetheless, in Pakistan, the use of technology in classrooms is still restricted, especially in public institutions. This research aimed to assess the B.Ed. students' current knowledge, abilities, and attitudes about Web 2.0 technologies for classroom instruction. The research design used in this study was a descriptive survey. A total of 550 B.Ed. Students involved in the study were from the first, second, or third year of the Faculty of Education. Using Krejcie and Morgan's sample size table, this study selected a sample of n=226 pre-service teachers by random sampling technique; the sample return rate was 200 pre-service teachers. This study employed a 30-item questionnaire on a five-point Likert scale to gather data. The tool was adopted. Experts reviewed the tool, and factor analysis also confirmed its validity. Cronbach's alpha was reliable, as it was 0.80. The procedure of data analysis using the mean, standard deviation, and factor analysis. The results clearly showed three areas, e.g., Attitude, Skills, and Knowledge. Mostly, pre-service teachers had good attitudes and average skills. 80% of the pre-service teachers who answered were female, and 20% were male. 82% of pre-service teachers thought that WhatsApp is a good way to communicate with colleagues, classmates, teachers, and students, with an average attitude score of m=3.81. The average score for skills was m=3.48. 76% were sure they could use the internet well, but less than forty percent <40% were sure they could create advanced content. Knowledge scores showed that 68% had a good understanding of the concepts, but <50% less than half could use Web 2.0 tools well in the classroom. They were better at using the internet for basic tasks and for personal use, and worse at making advanced content for classroom teaching and learning. To sum up, pre-service teachers require additional instruction and inspiration to effectively utilize Web 2.0 resources. The main suggestion is to add hands-on Web 2.0 training to B.Ed. programs that teach prospective teachers how to use technology more effectively for both technical and instructional objectives, particularly in public schools.

Keywords: *Web 2.0 technologies, pre-service teachers, Knowledge, Skills, Attitude (KSA), B.Ed. Programs (1.5,2.5)*

INTRODUCTION

Recently, the Web 2.0 platform has changed the face of education. These innovations are transforming instructors' roles and altering classroom dynamics. Currently, technology is integral to educational environments; it facilitates daily operations and provides students with access to vast information via the internet. As technology progresses, educators are preparing to adapt accordingly. Web 2.0 tools are defined as online software applications that enable users to engage in various activities. These activities include instructional curriculum development, video and picture production and editing, cooperation, data storage, and more tasks (Soomro, 2023). These programs can be used both within and outside of the classroom, and they are frequently complementary. In this rapidly evolving digital age, the use of Web 2.0 technologies in education has altered how teaching and learning are organized, carried out, and experienced. Web 2.0 is made up of interactive, user-generated content and collaborative online platforms. Some of the tools that make up Web 2.0 are blogs, wikis, podcasts, social media, online forums, and collaborative document editors. These tools give students the power to actively participate in making and sharing knowledge instead of just passively receiving it. For future teachers, knowing how to use these technologies well is no longer an optional skill; it is a necessary professional skill (Say, 2020).

Pre-service teachers, especially those in B.Ed. programs (1.5 years, 2.5 years, and B.Ed. Hons Elementary), are at a very important point in their professional development. As future teachers, they need to learn more than just the subject matter and how to teach it. They also need to learn how to use Web 2.0 apps in the classroom. How well they use these technologies in the future will depend on how much they know about them, how good they are at using them, and how they feel about them (Leh et al., 2021). Web 2.0 technologies have a lot of potential for interactive learning, but pre-service teachers don't all have the same level of knowledge, skills, and positive attitudes needed to use them effectively. These traits can be shaped by things like prior experience, support from the institution, personal interest, and confidence in using technology. To design targeted training programs for prospective teachers, knowing how well they now possess these abilities is crucial. As with every subject, there are two perspectives on using Web 2.0. Some individuals question if instructors and educators are adequately equipped to use the technologies to their fullest potential. Integrating a novel learning methodology is inherently challenging, and some individuals see this as their primary apprehension. Technology must be both learnable and successful in educating youngsters globally (Kim & Jang, 2015).

Web 2.0 technologies have often emerged in discussions in recent years. This is due to the swiftly changing environment we inhabit and the intrinsic lag that educational approaches consistently exhibit. You could be enquiring about the significance of 2.0. It is designated as 2.0 due to enhancements and modifications resulting from advancements in technology and expertise (Perumal, 2022). Wikipedia characterizes Web 2.0 as "web applications that facilitate interactive information sharing, interoperability, user-centered design, and collaboration on the World Wide Web." This refers to applications that promote learning, sharing, and collaboration online. Instead of only consuming information like we did with Web 1.0, we are using it as a resource to enhance skills and knowledge in other areas. Previously, we frequently used the library to read books; today, we possess the ability to read and compose books informed by our accumulated experiences. Individuals are more predisposed to be content makers and active participants online rather than passive spectators (Badiger & Prabhu, 2018). The internet, once a means for information dissemination, has evolved into a platform for collaboration and idea exchange. Web 2.0 is seen as a social revolution in this context (Den Exter, Rowe, Boyd, & Lloyd, 2012).

Engaging with Facebook, Instagram, blogs, Wikipedia for research, podcasts, or similar activities signifies your active participation in Web 2.0. Numerous apps enable users to disseminate material and establish networks of like-minded individuals. Consequently, some individuals advocate for its complete adoption for our pupils. The capacity to use tags or keywords for rapid content retrieval and collective knowledge

categorisation is the convenience that some individuals want to provide into the educational realm. Web 2.0 technologies provide transparency, collaboration, content sharing, microcontent aggregation, social networking, and more functionalities (An & Williams, 2010).

Brown & Adler concluded that Web 2.0 technologies have blurred the line between content suppliers and users, shifting emphasis from information access to interpersonal connectivity. The introduction of innovative learning and information-sharing methods encourages students to remix and repurpose online materials while generating new knowledge from their acquired understanding (Badiger & Prabhu, 2018). The issue of passive learning has impacted educational environments globally; yet, with Web 2.0, students are more inclined to engage actively in their learning process. The classroom setting might go from students passively listening to lectures to actively engaging and participating in the day's instructional plans. This has the capacity to transform the whole concept of education and learning. A persistent challenge in educational institutions throughout history is maintaining student engagement. Despite concentrating entirely on the lecturer at the front of the class, you cannot ensure that your attention will not sometimes waver (Choudhury, 2014). This issue is addressed using Web 2.0 techniques. Content consumption is replaced by content authorization, facilitating the creation of learning. A fundamental element of integrating the Web 2.0 paradigm in education is participatory culture. These platforms provide several chances for students to engage with peers, educators, experts, and others online who possess expertise in the subject area. This establishes a novel approach to learning that transcends reliance on one source of knowledge (Khanzode & Sarode, 2016).

Students may also be motivated to engage with communities that facilitate learning outside the classroom, enabling them to practise their subject via collaborative learning and constructive inquiry. This fosters genuine, real-world learning groups that provide substantial knowledge acquisition. Web 2.0 enables individualised learning, establishing a secure educational environment for every learner. Students are more adept at selecting their preferred method of knowledge acquisition, hence optimising their learning potential. This approach enables individuals to study in many circumstances that suit them uniquely (Kujur & Chhetri, 2015).

Numerous advantages exist regarding the enhanced and efficient use of Web 2.0 technologies for pupils. Several distinct benefits include the elements of cooperation and engagement that promote deeper, more substantive communication. There is a rise in innovation and understanding. Web 2.0 offers a level of flexibility and user-friendliness that is not assured with other learning tools. Ultimately, pupils have shown improvement in their technological and writing skills. Numerous students have affirmed the community that emerges from Web 2.0 technologies in relation to cooperation, engagement, and communication. The pooling of resources is essential for achieving this objective. A student may get knowledge from an online source but may want additional data from a peer in the classroom who acquired comparable information to synthesise it into a coherent understanding (Moshahid & Pt, 2017).

A heightened feeling of connectedness facilitates access to the global repository of information. Reports indicate a decrease in the gap between instructor and student. Educators are often delighted when their pupils adopt an active role in their learning process. Web 2.0 technologies enhance efficiency while promoting learning as a more collaborative endeavour (Nyaaba et al., 2024).

Regarding flexibility and usability, several students have said that Web 2.0 tools need less technical proficiency, and they appreciated the opportunity to adapt to new technology (Gencer et al., 2023). Individuals apprehensive about the incorporation of these novel technologies should recognise that pupils often possess more adaptability to change than is often assumed. Web 2.0 has enhanced pupils' writing skills and their ability to use technology in their tasks. This is beneficial when considering the evolution of the

globe. Technology is becoming integral to daily life, and equipping kids for this reality should be paramount (Nyaaba et al., 2024).

Web 2.0 applications' interactive features boost student enthusiasm and engagement. YouTube's multimedia content may increase students' interest in and enjoyment of studying (Greenhow et al., 2009). Instruments such as wikis and Google Docs facilitate collaborative learning by allowing students to collaborate on projects and tasks, hence enhancing collaboration and collective problem-solving (Bower et al., 2010). Blogs also serve as a medium for reflective practice, enabling pre-service teachers to chronicle their educational journeys, contemplate their experiences, and get feedback from colleagues and educators (Downes, 2004). Social networking platforms also enable the formation of professional learning communities, allowing pre-service educators to exchange materials, deliberate on best practices, and foster mutual professional advancement (Mazer et al., 2007). Regarding the Web 2.0 technologies provide access to a wide array of educational materials, including videos, articles, and interactive information, which may augment the teaching and learning experience (Burke & Snyder, 2008).

While Web 2.0 offers several advantages and benefits for students, certain downsides must not be overlooked. Reports indicate discomfort over the transparency of Web 2.0, many technological issues, and the element of time expenditure. As with any situation, the introduction of a new technique or approach into a mostly static setting is likely to encounter certain challenges. The transparency of Web 2.0 technologies has generated unease over their use and hesitation to engage in classroom activities. Certain students may feel uneasy about the public aspect of interacting using these contemporary technologies, preferring direct engagement between instructor and student. A further grievance is to the technical issues associated with the use of this new technology in educational institutions. Certain educators and learners are not prepared to manage such changes, resulting in a reluctance to engage in learning. This may result in more issues than benefits. Completely altering a conventional teaching methodology might provide a significant barrier.

The unequal access to essential technologies and internet connections among pupils may yield differences in educational prospects (Selwyn, 2010). Concerns about privacy and data security arise from the usage of social networking sites and other Web 2.0 platforms, necessitating meticulous management (Wodzicki et al., 2012). The user-generated aspect of Web 2.0 content implies that not all information is accurate or trustworthy. Students must develop critical assessment abilities to identify reputable sources (Rudestam & Schoenholtz-Read, 2010). Incorporating Web 2.0 technologies into the curriculum requires meticulous preparation and alignment with educational goals, posing challenges for educators (Bower et al., 2010). Educators and learners may encounter technical challenges while using Web 2.0 applications, necessitating sufficient technical assistance and training (Parker & Chao, 2007).

In addition to the technical issues, the process of learning and administering the new technology is notably time-consuming. If an individual is not fully committed to maximizing the potential of Web 2.0, it may lead to a deficiency of excitement that is conveyed from the teacher to the pupils. Many contend that this detracts from the essential time allocated for the subject matter that must be taught within a certain timeframe. Redmann and Kotrlik (2004) delineated the conventional learner's process of attending a lecture, taking notes, and studying for a written examination. This old educational environment fails to equip learners for the modern workforce that prevails today. Technology-enhanced learning settings provide students with the requisite information and skills for success in the twenty-first century. Employers want candidates who are reliable, educated, capable of reasoning, proficient in communication, adept at problem-solving, and technologically proficient (Lam, 2007). Career and Technical Education (CTE) programs must maintain their dedication to preparing students to be proficient participants in the twenty-first century labour market. Hosler and Meggison (2008) posited that alterations in course content and delivery methods are unavoidable; yet the combined aims of imparting occupational skills and fostering economic competence

have historically been, and should continue to be, paramount. Bruett (2006) said that it is essential for students to be equipped to compete in the global economy, which relies on contemporary technology. CTE programs are recognised for instructing and equipping students for workforce entry. Lowther, Inan, Daniel-Strahl, and Ross (2008) saw two emerging themes in the pursuit of technology integration: equipping students for the workforce and enhancing student knowledge and skills. Career & Technical Education instructors must persist in equipping adolescents with vital job skills, which necessitates the successful integration of technology. Educators across all disciplines must take responsibility for equipping students to succeed in the world outside our classrooms. The use of technology and the possession of requisite abilities for its integration will enable students to thrive in any setting.

Rakes, Fields, and Cox (2006) posited that the confidence level of instructors in incorporating technology, together with their perceptions about its effect on student accomplishment, significantly influences classroom dynamics. Educators must have sufficient training to effectively incorporate technology into the curriculum. Young (2005) asserts that the comprehensive cycle of faculty proficiency development is intricate due to the focus on cultivating technical capabilities without simultaneously enhancing instructional methods that facilitate improved learning outcomes. Technical abilities are essential for technological integration; however, mastering the efficient incorporation of such talents into the educational setting is crucial.

A variety of Web 2.0 technologies that improve communication, teamwork, collaboration, and content creation in the teaching and learning process are part of Web 2.0 digital platforms. The Web 2.0 tools that are most frequently utilized in educational learning are:

1. Blogs and microblogs, such as Blogger and Twitter, provide platforms for reflective writing, exchanging ideas, and participating in professional conversation (Downes, 2004).
2. Wikis: Collaborative platforms like Wikipedia and Wikispaces enable students to co-create information, hence augmenting collaborative learning and knowledge dissemination (Parker & Chao, 2007).
3. Social Networking Platforms: Facebook and LinkedIn facilitate networking, professional advancement, and the establishment of learning groups (Mazer et al., 2007).
4. YouTube and Flickr facilitate the dissemination of films and photos, enhancing educational experience via multimedia material (Burke & Snyder, 2008).
5. Collaborative Tools: Google Docs and Microsoft OneDrive provide simultaneous collaboration on documents, presentations, and spreadsheets (Bower et al., 2010).

Statement of the Problem

There is evidence that many pre-service teachers are not completely prepared to use Web 2.0 tools for teaching and learning, despite the fact that more and more individuals are realizing how crucial it is to use technology in schools. Some students in teacher education programs may know how to use some apps (like social media and YouTube) on a basic level, but they don't know how to use them in a deeper way for lesson planning, student collaboration, and formative assessment (Gencer et al., 2023).

In Pakistan, especially in public and private universities that offer B.Ed. programs, there is inconsistent utilization of Web 2.0 skills in teacher preparation. Many pre-service teachers may have good feelings about technology, but they may not have the structured training, confidence, and real-world skills they need to

use these tools effectively in the classroom. There is a big difference between what Web 2.0 technologies can do and how they are actually used in pre-service teacher training. This makes it hard to make sure that future teachers are ready for the demands of 21st-century teaching (Mahmud et al., 2023).

So, it's important to find out that students of B.Ed. programs (1.5 years, 2.5 years, and B.Ed. (Hons) Elementary) should know what skills they possess and how they feel about using Web 2.0 technologies, to determine their strengths and areas for improvement. If teacher education programs don't do this kind of assessment, they could end up with graduates who aren't ready to use technology effectively in their future classrooms, which would limit opportunities for interactive, student-centered learning (Amaaz et al., 2024).

Objectives of the Research

1. To assess the basic state of knowledge of pre-service teachers for Web 2.0 tools and resources.
2. To explore the level of practical skills that pre-service teachers possess for Web 2.0 tools and resources.
3. To measure the attitude of pre-service teachers toward Web 2.0 tools in their prospective careers.

REVIEW OF RELATED LITERATURE

The use of Web 2.0 digital applications in educational instruction significantly influences teaching and learning methodologies. Web 2.0 technologies transition the emphasis from teacher-centered to student-centered learning, whereby students engage actively in their educational process (Greenhow et al., 2009). The collaborative characteristics of Web 2.0 technologies facilitate collaborative teaching, promoting student cooperation, idea exchange, and collective knowledge creation (Parker & Chao, 2007). Web 2.0 technologies promote heightened engagement between students and instructors, as well as among peers, cultivating a more dynamic and engaging learning environment (Mazer et al., 2007). Blogging and other reflecting instruments facilitate student contemplation of their learning experiences, fostering enhanced comprehension and ongoing development (Downes, 2004).

Blogs, wikis, Google Docs, YouTube, and other Web 2.0 technologies are well-known for changing the way people learn from teacher-centered to more collaborative, student-centered, and participatory forms of instruction. Researchers say that the interactive, remixable, and shareable features of Web 2.0 help students learn important 21st-century skills like working together, using technology, being creative, and communicating. This makes these tools useful for classroom activities and project-based learning. Studies that argue for Web 2.0's ability to create "knowledge ecosystems" through collaborative writing, sharing, and co-construction of content (Alkhudaydi, 2018) put a lot of emphasis on this conceptual grounding.

Several studies in the real world have found that structured lessons and practice with Web 2.0 tools have positive effects on pre-service teachers. A study with Turkish pre-service classroom teachers found that a course that used Web 2.0 apps made them feel much more confident about teaching science and had a better attitude towards it than a regular course. Both groups got better over time, but the Web 2.0 group got better on post-test measures. The authors say that using Web 2.0 tools in a hands-on, scaffolded way while preparing to be a teacher can improve both confidence and attitudes that are important for future classroom practice (Say & Yıldırım, 2020).

A study from South Korea that supports this shows that pre-service teachers who enjoyed and actively used Web 2.0 tools during a technology course were very likely to use those tools during their teaching internships. The study used a TAM-informed tool and logistic regression on internship outcomes to find that perceived enjoyment was a better predictor of actual classroom use than perceived usefulness or ease

of use. The authors suggest that teacher-education courses should be designed in a way that makes them interested in and of themselves (for example, through project-based learning, real-world tasks, and artefact creation). This will help pre-service teachers learn the skills and motivation they need to use Web 2.0 practices in real classrooms (Kim & Jang, 2015).

However, in-service teachers have different opinions, and sometimes they are neutral, which makes integration more difficult in some situations. A survey of high school teachers in Saudi Arabia found that most of them had a neutral attitude towards using Web 2.0 tools. Also, demographic factors like age or years of experience did not reliably predict attitude in that sample. The authors of the study pointed out some problems with it (the small, single-city sample), but they stressed that neutral attitudes show that teachers need targeted professional development and changes to the curriculum to get more teachers on board (Alkhudaydi, 2018).

One thing that comes up in many studies is that knowledge and a positive attitude are not enough. Pre-service teachers also need structured modelling of how to teach, lots of hands-on practice, feedback on designs that work in the classroom, and early internship opportunities to turn their intentions into actions. Several authors say that being able to click around on a site is not the same as being able to design a lesson that uses a blog, wiki, or Google Doc to help students learn. Teacher education programs need to make this difference clear (Say & Yildirim, 2020).

Some methodological notes and gaps in the literature are: (1) there aren't enough longitudinal or follow-up studies that look at whether pre-service teachers keep using Web 2.0 tools as in-service teachers; (2) there isn't enough experimental or quasi-experimental research that isolates which course components (enjoyment, practice hours, mentoring, internship placement) lead to lasting changes; and (3) there aren't enough shared datasets and measurement harmonisation across contexts, which makes Some writers want designs that are more rigorous and measure actual classroom adoption (not just intention), use bigger and more diverse samples, and report shared instruments so that results can be compared and pooled (Kim & Jang, 2015; Say & Yildirim, 2020).

A common theme in the studies is that knowledge and a positive attitude are not enough. Pre-service teachers also need structured pedagogical modelling, lots of hands-on practice, feedback on designs that are appropriate for the classroom, and early internship opportunities to turn their intentions into actions. Several authors say that being able to click around on a site is not the same as being able to design a lesson that uses a blog, wiki, or Google Doc to help students learn. Teacher education programs need to make this difference clear (Say & Yildirim, 2020).

There are some methodological notes and gaps in the literature, such as: (1) a lack of longitudinal or follow-up studies that look at whether pre-service teachers continue to use Web 2.0 tools as in-service teachers; (2) a lack of experimental or quasi-experimental research that isolates which course components (enjoyment, practice hours, mentoring, internship placement) lead to long-lasting changes; and (3) a lack of shared datasets and measurement harmonization across contexts, which makes it : Several writers have asked for more rigorous designs that measure actual classroom adoption (not just intention), use bigger and more diverse samples, and share instruments so that results can be compared and combined (Kim & Jang, 2015; Say & Yildirim, 2020).

Large sample surveys consistently show that self-efficacy and TPACK-related skills are good indicators of whether someone is ready to use Web 2.0 tools. Several recent large-scale surveys and cross-sectional studies have reported that pre-service teachers' self-efficacy for technology integration and their technological pedagogical competence (TPACK components) are significant predictors of both their reported skills and their readiness to use Web 2.0 in lesson design. These studies show that self-efficacy should be measured

separately from just being familiar with tools. Higher self-efficacy is linked to more complicated teaching uses, like making interactive tasks or using online tools for formative assessment, instead of just using tech for presentations. (Birisci & Kul; Keser et al.; ERIC self-efficacy review).

Web 2.0 content creation lessons help B.Ed. students improve their skills and boost their confidence. Recent experimental and quasi-experimental studies with large samples in Turkey and Brazil have shown that short, structured training modules on Web 2.0 content creation (like making interactive lessons with blogs, digital portfolios, and video-based micro-teaching using YouTube/EdPuzzle) greatly improve pre-service teachers' confidence in their ability to create digital materials, as well as their actual ability to do so. These intervention studies show that adding clear, graded practical tasks to B.Ed. programs leads to measurable improvements in skills and in the students' confidence in their ability to use Web 2.0 tools. (Erdoğan & Yıldırım, 2022; study of math teachers in training).

Attitudes and tool literacy work together with self-regulation to predict how well prospective teachers learn and how well they use tools in the classroom. A study from 2021 to 2022 looked at the personal learning environments of pre-service teachers. It found that tool literacy, metacognitive self-regulation, and perceived enjoyment all led to more positive attitudes and higher reported use of Web 2.0 for personal learning, which then affected their plans to use them in the classroom. To sum up, enjoyable, self-directed experiences with Web 2.0 during training help turn tool knowledge into teaching intent. This has direct effects on B.Ed. courses: make tasks that are fun, build on each other, and help students learn how to learn on their own. (ACM / Educational Technology studies for 2021–2022). Recent research studies on science and social studies, B.Ed. cohorts shows that there are differences between subject areas. For example, pre-service science teachers reported higher gains in their ability to create digital materials after Web 2.0 training. This is probably because they were already familiar with laboratory simulations, data visualization, and inquiry tasks. On the other hand, social studies and language preservice teachers said that collaborative publishing (like blogs and wikis) was the most important. Because of these differences in subjects, B.Ed. programs should make Web 2.0 training examples that are specific to the tasks teachers will have to do in their own subjects.

There are still gaps in longitudinal evidence and cross-context generalizability. There have been a lot of studies lately that show immediate post-training gains (knowledge, skills, self-efficacy), but there aren't many long-term studies that show how long pre-service teachers keep using what they learnt once they become in-service. Also, most intervention studies are only done in certain countries (like Turkey, Korea, and the Philippines), which makes it hard to make generalizations. More multi-site longitudinal research is needed to find out which training elements lead to lasting behavior change in different settings. This strengthens gaps that were found earlier and shows that B.Ed. research needs follow-up designs.

RESEARCH METHODOLOGY AND DESIGN

This study used a descriptive survey research design, it is a popular method for learning about the beliefs, attitudes, and traits of a population at a certain point in time. According to Creswell (2014), a survey design "studies a sample of a population and gives a quantitative or numeric description of trends, attitudes, or opinions of that population." This design was selected for the current study because it allowed the researcher to collect data about the attitudes, knowledge, and abilities of prospective teachers toward the use of Web 2.0 technology.

Target Population

A total of 550 prospective teachers enrolled in the Faculty of Education, University of Sindh, were selected as the target population of the study.

Sample Size and Sampling

To guarantee that every student in the target population had an equal chance of being selected for the study, the sample size was established using the random sampling technique. The sample size from the complete targeted population was determined using Krejcie and Morgan's (1970) sample size calculation table. A total sample size of $n=226$ prospective teachers was selected with a margin of error of 0.05.

Research Instrument

For data collection, a five-point Likert scale survey questionnaire was adopted from the study Fauziah Che Leh, Arnold Anduroh, Miftachul Hudasef (2021) with 30 items. The survey questionnaire comprised three areas: knowledge, skills, and attitudes about using Web 2.0 technology in teaching and learning.

Reliability and Validity of the Research Instrument

Experts in educational technology reviewed the instrument to make sure it was valid, and factor analysis was used to check that the items accurately represented the constructs they were meant to. Reliability was done via pilot study with 10% of the sample. The next step was to figure out the Cronbach's alpha coefficient, which showed that the internal consistency was good with a score of 0.80 (George & Mallery, 2010).

Procedure to Analyse Data

Descriptive statistics, like the mean and standard deviation for each item, were used, and factor analysis was used to find the underlying constructs in the data.

Ethical Consideration

All the principles and rules that make research ethical were strictly followed. According to research ethics, participants were first taken in confidence before the data collection and told about the research objectives and the aim of the study. A consent form was signed by the participants. Researchers assured the confidentiality of the participants. The information of the participants would be kept private, and they were free to choose whether or not to take part.

ANALYSIS OF DATA

Demographic Data of the Prospective Teachers

Table 1 Gender					
Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Male	40	20.0	20.0	20.0

	2 Female	160	80.0	80.0	100.0
	Total	200	100.0	100.0	

Table 2 Age

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 17 – 22	87	43.5	43.5	43.5
	2 23 – 28	60	30.0	30.0	73.5
	3 29 and above	48	24.0	24.0	97.5
	4	5	2.5	2.5	100.0
	Total	200	100.0	100.0	

Table 3 Year Current year of study

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 1st Year	10	5.0	5.0	5.0
	2 2nd Year	43	21.5	21.5	26.5
	3 3rd Year	71	35.5	35.5	62.0
	4 4th Year	76	38.0	38.0	100.0
	Total	200	100.0	100.0	

Table 4 Program Study Program

Variable		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 B.Ed. 1.5	91	45.5	45.5	45.5
	2 B.Ed 2.5	11	5.5	5.5	51.0
	3 B.Ed. (Hons)	98	49.0	49.0	100.0
	Total	200	100.0	100.0	

Analysis Breakdown: The majority of respondents who participated were female students (160; 80.0%), while just 20.0% (40) were male students. Since the Faculty of Education at the University of Sindh has a higher enrolment of female students, the research included an 80% female student sample. The majority of

pre-service teachers (87; 43.5%) were in the 17–22 age range, followed by those in the 23–28 age range (60; 30.0%), and those in the 29+ age range (48; 24.0%). Five (5) pre-service teachers (2.5%) did not respond to the age. The large group of pre-service teachers was from the 4th year (final year students) (76; 38.0%), followed by the 3rd year (71; 35.5%), the 2nd year (43; 21.5%), and the 1st year (10; 5.0%). Almost half of the respondents (98; 49.0%) were in the B.Ed. (Hons) Elementary program. 45.5% (91) were in the B.Ed. 1.5-year program, and 5.5% (11) were in the B.Ed. 2.5-year program.

FACTOR ANALYSIS

Table: 5 Sampling Adequacy and Suitability for factor analysis

<i>KMO and Bartlett's Test</i>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.718
Bartlett's Test of Sphericity	Approx. Chi-Square	2931.431
	df	435
	Sig.	.000

The acceptable criterion of 0.6 is exceeded by the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy of 0.718. This shows that the data is appropriate for factor analysis and the sample size is adequate. Furthermore, Bartlett's Test of Sphericity is significant ($\chi^2 = 2931.431$, $df = 435$, $p < 0.001$), indicating that factor analysis is suitable due to the strong correlations between variables.

Table: 6 Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.148	10.492	40.241	3.148	10.492	40.241	3.170	10.568	40.241
2	5.272	17.574	17.574	5.272	17.574	17.574	5.003	16.675	16.675
3	3.653	12.176	29.749	3.653	12.176	29.749	3.899	12.998	29.674
4	1.841	6.137	46.378						
5	1.738	5.795	52.173						

6	1.54 2	5.140	57.313						
7	1.32 3	4.408	61.721						
8	1.18 7	3.955	65.676						
9	1.10 8	3.695	69.371						
10	.984	3.279	72.650						
11	.957	3.192	75.842						
12	.838	2.794	78.636						
13	.701	2.338	80.974						
14	.689	2.296	83.270						
15	.607	2.025	85.295						
16	.542	1.806	87.101						
17	.516	1.720	88.821						
18	.431	1.437	90.258						
19	.415	1.384	91.642						
20	.396	1.321	92.963						
21	.356	1.186	94.149						
22	.338	1.127	95.276						
23	.282	.941	96.217						
24	.230	.766	96.983						
25	.215	.715	97.698						
26	.204	.679	98.377						
27	.148	.495	98.872						
28	.128	.426	99.298						

29	.107	.357	99.655					
30	.104	.345	100.000					

Extraction Method: Principal Component Analysis.

Based on the rotational solution, the study identified three primary components (factors): Component 1: Contributes 16.68% of the variation. 12.99% of the variance is explained by component 2. 10.57% of the variance is explained by component 3. When combined, these three factors account for about 40.24% of the variance. This implies that a significant amount of the data's information is captured by the extracted factors.

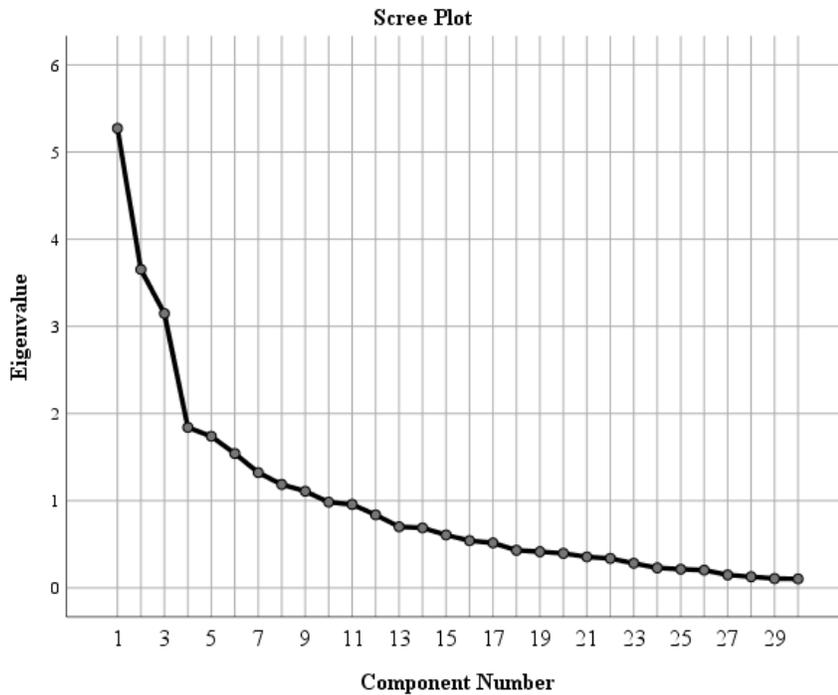


Table: 7 Factors(Components)

<i>Rotated Component Matrix^a</i>			
	Component		
	Knowledge	Skills	Attitude
Knowledge1. I am good at using Google platform to browse the Internet.	.758		

Knowledge3. I am good at downloading and uploading content for teaching and learning reasons.	.729		
Knowledge7. I possess the capability to design and construct integrated learning activities using web apps, both individually and collaboratively, for use in and out of the classroom.	.694		
knowledge8. I can create diverse web-based application media for student reference.	.692		
Knowledge6. I often enhance my knowledge and abilities via possibilities for learning new technologies.	.655		
Knowledge5. I possess the ability to modify material utilization to enhance the diversity of research and development activities in the classroom.	.537		
Knowledge2. I am proficient at using email as a means of disseminating information to pupils.	.534		
knowledge10. I can use YouTube for teaching and learning reasons.	.505		
knowledge9. I am proficient at signing in and signing out of each web program I use.	.449		
Knowledge4. I may use several methodologies in web apps for teaching and learning objectives.	.447		
Skills5. I possess comprehensive abilities and expertise in using the web.		.740	
Skills1. I can use website platforms as search tools.		.737	
Skills8. I can create and developing films and images utilizing web apps.		.695	
Skills10. I can create SlideShare presentations for teaching and learning reasons both within and outside the classroom.		.682	

Skills9. I may engage with pupils via social apps.		.659	
Skills6. I may use web apps to obtain and upload information for teaching and learning reasons.		.550	
Skills4. Educational websites really assist me in acquiring knowledge.		.529	
Skills3. I possess the ability to use Google for web browsing.		.494	
Skills7. The web program I use for teaching and learning is consistently updated to provide students with the latest information.		.482	
Skills2. I consistently use information from internet websites.		.414	
Attitude5. Educational web portals enhance my studying experience.			.843
Attitude4. The information obtained via web apps, particularly personal blogs, may lack accuracy.			.839
Attitude6. Web apps serve as engaging tools in the classroom.			.797
Attitude7. Most of the web technologies I am familiar with may enhance teaching and learning methodologies while also augmenting students' critical thinking skills.			.791
Attitude3. I assimilate new technology with ease.			.759
Attitude8. Web apps have the potential to replace textbooks in educational settings.			.670
Attitude10. The use of web apps is an inefficient expenditure of time.			.665
Attitude2. WhatsApp serves as an excellent communication tool for all users.			.604
Attitude9. I am uncertain about the characteristics included in Web 2.0 apps.			.602

Attitudel. Facebook, blogs, and Twitter (X) are the primary platforms for individuals to disseminate information and express views.			.601
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 4 iterations.			

Three different elements are identified by the rotational component matrix: Attitude: Items like "Educational Web Portals help to improve my learning" and "Web applications are interesting media in the classroom" heavily influence this factor. The opinions of respondents about web applications in teaching and learning (T&L) are represented by this group. Skills: This aspect is heavily influenced by statements such as "I can use the Website platform as a search medium" and "I have extensive skills and knowledge in using the Web." This reflects respondents' self-perceived skills in using web technologies. Knowledge: Items such as "I can use the Google platform to surf the Internet" and "I can download and upload information for T&L purposes" load on this factor. It represents respondents' knowledge and ability to use various web applications for educational purposes. The factor loadings are generally strong (mostly above 0.5), indicating that the items are good measures of their respective factors. Principal Component Analysis was employed as the extraction technique, while Varimax rotation was used to improve factor differentiation. Rotation converged after four iterations, suggesting a stable and interpretable factor solution.

DESCRIPTIVE ANALYSIS OF THE KSA SCALE

Table: 8 Descriptive Statistics of Knowledge

Statement	Mean	Std. Deviation
Knowledge1. I am good at using Google platform to browse the Internet.	2.72	1.221
Knowledge2. I am proficient at using email as a means of disseminating information to pupils.	2.83	1.262
Knowledge3. I am good at downloading and uploading content for teaching and learning reasons.	2.89	1.204
Knowledge4. I may use several methodologies in web apps for teaching and learning objectives.	3.12	1.200
Knowledge5. I possess the ability to modify material utilization to enhance the diversity of research and development activities in the classroom.	2.85	1.267

Knowledge6. I often enhance my knowledge and abilities via possibilities for learning new technologies.	3.26	1.130
Knowledge7. I possess the capability to design and construct integrated learning activities using web apps, both individually and collaboratively, for use in and out of the classroom.	3.31	1.118
knowledge8. I can create diverse web-based application media for student reference.	2.81	1.274
knowledge9. I am proficient at signing in and signing out of each web program I use.	3.22	1.166
knowledge10. I can use YouTube for teaching and learning reasons.	2.90	1.260
Knowledge	2.99	.652

N=200

Analysis: Table 4-4 presents descriptive statistics for each item of knowledge scale, reflecting the respondents' level of agreement with their ability to use technology for teaching and learning. The majority of respondents exhibit moderate confidence in their talents, with an average score of around $m=2.99$, which falls below $m=3$ on a scale of 5. Respondents express the most comfort in using new technologies for activity planning and acquiring knowledge. The majority of respondents lack confidence in using Google and other online applications for instructional purposes. While there are variations in the responds, it seems that many respondents might enhance their use of technology.

Table: 9 Descriptive Statistics of the Skills

Statements	Mean	Std. Deviation
Skills1. I can use website platforms as search tools.	3.40	1.056
Skills2. I consistently use information from internet websites.	3.63	.882
Skills3. I possess the ability to use Google for web browsing.	3.66	.888
Skills4. Educational websites really assist me in acquiring knowledge.	3.53	.924
Skills5. I possess comprehensive abilities and expertise in using the web.	3.38	1.063

Skills6. I may use web apps to obtain and upload information for teaching and learning reasons.	3.55	1.088
Skills7. The web program I use for teaching and learning is consistently updated to provide students with the latest information.	3.50	1.075
Skills8. I can create and develop films and images utilizing web apps.	3.35	1.159
Skills9. I may engage with pupils via social apps.	3.51	1.080
Skills10. I can create SlideShare presentations for teaching and learning reasons both within and outside the classroom.	3.30	1.142
Skills	3.48	.635

N=200

Analysis: Table 4-5 indicates that the majority of survey respondents express moderate confidence in their Web 2.0 abilities, yielding an average score of $m=3.48$ out of 5. They are most comfortable using the internet to research information, particularly on Google and educational platforms. However, they discovered that for more complex tasks, such as creating videos, graphics, or presentation slides, their confidence diminishes, indicating their insufficient proficiency in utilizing Web 2.0 applications for effective teaching and learning. Nonetheless, they possess the skills necessary for information retrieval for personal use. The standard deviations indicate variations in the respondents' ability levels; nonetheless, the majority exhibit more proficiency in fundamental web 2.0 abilities compared to more advanced or creative online competencies.

Table: 10 Descriptive statistics of the Attitude

Statements	Mean	Std. Deviation
Attitude1. Facebook, blogs, and Twitter (X) are the primary platforms for individuals to disseminate information and express views.	3.35	1.105
Attitude2. WhatsApp serves as an excellent communication tool for all users.	4.04	.693
Attitude3. I assimilate new technology with ease.	3.87	.725
Attitude4. The information obtained via web apps, particularly personal blogs, may lack accuracy.	3.98	.709
Attitude5. Educational web portals enhance my studying experience.	3.98	.726

Attitude6. Web apps serve as engaging tools in the classroom.	3.84	.782
Attitude7. Most of the web technologies I am familiar with may enhance teaching and learning methodologies while also augmenting students' critical thinking skills.	3.93	.715
	3.91	.816
Attitude8. Web apps have the potential to replace textbooks in educational settings.	3.63	.871
Attitude9. I am uncertain about the characteristics included in Web 2.0 apps.	3.60	.827
Attitude	3.81	.527

N=200

Analysis: Table 4-6 illustrates the respondents' attitudes about the use of Web 2.0 technologies and applications in teaching and learning. The average score of $m=3.81$ out of 5 indicates that the majority of respondents possess a favorable disposition. The majority of respondents (mean = 4.04) agree that WhatsApp serves as an effective communication tool, and that educational online portals and applications may enhance learning for both instructors and students (mean = 3.9 to 4.0). There is recognition that Web 2.0 applications are beneficial and engaging in educational settings; yet concerns over the accuracy of online material (mean = 3.98) and ambiguity around the capabilities of Web 2.0 apps (mean = 3.63) persist. A lot of respondents believe that using Web 2.0 applications in the classroom is an inefficient use of time (mean = 3.60). The data indicate that respondents generally have a favorable view of using Web 2.0 technologies in the teaching and learning process; yet they also express caution over its limitations, availability, and dependability in the public sector schools.

DISCUSSION

Technology is inadequately employed in Pakistani classrooms, especially inside public schools. Despite attempts to incorporate technology in public schools, these initiatives are inadequate. Numerous rural schools lack any technological resources, and some do not even have electricity, rendering the integration of Web 2.0 technologies impractical. Conversely, many urban schools also experience a deficiency in technological integration. Consequently, newly appointed teachers, who possess substantial technological knowledge and personal devices such as mobile phones and laptops, could potentially implement web 2.0 technology independently. However, the main challenges lie in the prevailing environment and the attitudes of the teachers. There is a strong correlation between the lack of adequate facilities, internet connectivity, and contemporary teaching tools in many public schools and the preparedness and receptivity of future educators. This is evident in the mindset of future educators, particularly those enrolled in Bachelor of Education programs at public institutions, where the incorporation of technology is not currently a high priority. According to the findings, although some future educators have a passing familiarity with web apps, they exhibit little enthusiasm for acquiring and using Web 2.0 skills. Their lack of enthusiasm is due to a few factors. For instance, they haven't had many opportunities to practice teaching in classrooms with plenty of technology, their in-service instructors haven't set a strong example, and they didn't have much hands-on experience with technology in their own schooling.

The lack of instruction on effective technology integration into the B.Ed. program is another major issue. While the programs do a good job of covering the basics of teaching and the subjects they cover, they don't often provide instructors with adequate training on how to utilize Web 2.0 applications for student engagement, evaluation, and lesson preparation. Without clear instructions and opportunities for practice, pre-service teachers will not acquire the skills and confidence necessary to use these tools successfully in their future classrooms. This gap between what they know in theory and what they can do in practice makes them less ready for the demands of teaching in the 21st century.

The first step towards making real changes is to have a good attitude about integrating technology. Motivation is a big part of adopting new technology, and pre-service teachers need to see how Web 2.0 tools can help students learn better before they can use them. Once people are motivated, structured, hands-on training in both the technical and teaching aspects of Web 2.0 can help fill in the gaps that are already there. It is very important to train future teachers in Pakistan's public schools to be resourceful and flexible with the tools they have, since access to technology may not always be reliable.

CONCLUSION

The goal of this study was to look at how B.Ed. pre-service teachers feel, what they know, and what skills they have when it comes to using Web 2.0 technologies in the classroom. A descriptive survey research design (Creswell, 2014) was used to gather data from a random sample of 226 students out of a total of 550 students enrolled in the Faculty of Education's B.Ed. 1.5-year, 2.5-year, and B.Ed. (Hons) Elementary programs. We used a self-made, 33-item questionnaire based on a five-point Likert scale to collect data. Experts reviewed the instrument and factor analysis confirmed its validity. A pilot test with 10% of the sample not included in the final study showed that it was reliable, with a Cronbach's alpha of 0.80, which means that it had good internal consistency. We looked at data using factor analysis and descriptive statistics like the mean and standard deviation.

The results showed that the data naturally fell into three separate groups: Attitude, Skills, and Knowledge. This proved that the instrument was valid and reliable. Most of the people who answered the survey had a positive view of Web 2.0 technologies, but their skills were only average. They were more confident in using the internet for basic tasks and less confident in creating advanced content. Knowledge levels showed that the concepts were familiar, but they weren't very useful in teaching situations. In Pakistan, especially in public universities and schools, the lack of technology integration, not enough training on how to use digital tools in the classroom, and not enough exposure to them during field practice all make people less likely to use Web 2.0 technologies.

In general, the study finds that pre-service teachers know about the possibilities of Web 2.0 technologies, but they need to work on their teaching skills, boost their confidence, and get more motivated to use technology effectively in future classrooms. These results give curriculum planners, teacher educators, and policymakers useful information that they can use to come up with ways to close the gap between what students learn in theory and what they do in practice when using technology in the classroom.

RECOMMENDATIONS

- Public universities should include Web 2.0 teaching methods in their B.Ed. programs. These should include hands-on demonstrations, micro-teaching sessions, and subject-specific examples of how to use technology in the classroom.
- At the beginning of B.Ed. Courses offer motivational orientation programs to make students aware of how Web 2.0 tools can help them teach better and get students more involved.

- Collaborate or partner with those schools that have some access to technology for internships to give pre-service teachers more chances to practice in real classrooms.
- Make digital training modules that are cheap and work in a variety of settings, even those with few resources means low cost no cost philosophy. This way, future teachers can use Web 2.0 practices in the faculty of education premises no matter what kind of infrastructure they have.
- Encourage faculty development programs to teach teacher educators how to use Web 2.0, even now, Web 3.0 tools well, so they can show their students how to do it.
- Make peer-learning groups at universities where pre-service teachers can work together, share resources, and practice how to use Web 2.0 tools in lesson plans.
- Establish digital labs based on Web 2.0 and 3.0 technology in the Education departments in general public universities in Pakistan.

FUTURE DIRECTION

Researchers should conduct longitudinal research to follow pre-service teachers over time to see how their attitudes, skills, and knowledge of Web 2.0 technologies change from training to real-life teaching. Studies can also look at specific training programs, like workshops or micro-teaching with digital tools, to see which ones help pre-service teachers also in-service teachers to get better at what they do and feel more sure of themselves. It would be helpful to compare the results of public and private universities students, as well as students who are from rural backgrounds and those in cities, to see how different situations affect them in using technology. Interviews and focus groups are examples of qualitative studies that could help us understand teachers' problems and reasons for doing what they do. Lastly, universities, policymakers, and tech experts can work together on projects to come up with useful digital teaching methods that work in Pakistan's schools.

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