ASSESSMENT OF AWARENESS AND COMPREHENSION OF USAGE OF SMART MOBILE DEVICES FOR CHEMISTRY LEARNING AMONGST UNDERGRADUATE STUDENTS: A CASE STUDY AT KANDAHAR UNIVERSITY (KANDAHAR- AFGHANISTAN)

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ABSTRACT

The use of cell phones, and particularly "smart phones," seems to be widespread. The increasing functionality of mobile or smart phones has caused them to overtake PCs as the preferred technology for many consumers, particularly university students. Therefore, it must be understood that using these devices as a learning aid in higher education is unavoidable. The goal of this study was to determine whether university students in Kandahar, Afghanistan, were aware of using mobile devices in the learning of chemistry. The study was a descriptive survey and the questionnaire was distributed in the last three months of 2022 among chemistry department students at the University of Kandahar. The study utilized a sample of 152 undergraduate chemistry students. Students in their first year make up 30% of the sample, followed by those in their second year (22%), third year (26 %), and fourth year (22 %). A validated questionnaire served as the original study primary data collection tool. Using the Cronbach alpha method, the reliability of instrument was evaluated, and a reliability coefficient index of 0.83 was found. To respond to the three study-related research questions, mean and percentage were used. According to the research, undergraduate students use a variety of phones and mobile devices as social media for tasks like online charting, learning, and submitting assignments to gather pertinent course materials and obtain helpful information whenever and wherever they need it for academic purposes. So, it was advised that each student should have an Android phone for informational purposes. There should be more portable mobile gadgets produced by phone manufacturers. If at all possible, the university administration should give students access to the internet for free and without interruption.

Keywords: Smart mobile device, Awareness, Comprehension, Chemistry, Students.

Introduction

Since education is important for transmitting knowledge from teachers to students, it can help to eliminate illiteracy from society. Face-to-face interaction has been used for both teaching and learning [1,2]. But, with the development of information and communication technology (ICT), education can now move beyond in-person instruction to online teaching and learning using portable devices like smartphones, laptops, and tablets [3]. The internet can be accessed using mobile devices, which are handheld computers that utilize wireless fidelity (WiFi). Until Martin Cooper and Motorolla produced portable phones, technology in the 1940s was not transportable [1]. According to [4], mobile learning has resulted from the use of mobile devices for educational purposes. As a result of this digital development age, Wright observed that a large number of smartphones and other mobile gadgets have been introduced [22]. The sort of mobile device that students use may depend on user preferences, such as advanced computational skills, phone size and weight, and a battery that can run the device for a longer period of time. As stressed by Rothaernal [7], mobile device manufacturers have developed their creative thinking to incorporate new functions into the phones in order to outperform their rivals. According to UNESCO's 2002 statement that information and communication technology promotes education in the 21st century, these devices could allow students conveniently access information and enhance learning activities anywhere in the world [1].

According to Health, Vom Lehn, Hindmarch, and Svensson, the students must be very aware and responsive to advancements in the digital world [1,2]. Sanchez and his coauthors believe that awareness is the ability to respond to situations when a need arises [2]. The students' capacity to react to the usage of mobile devices for educational purposes demonstrates integration to the aspect of practical. The teachers must be well-trained and computer literate, especially given the importance of ICT, and the schools must be well-equipped with standard classrooms, libraries, and laboratories in order to acquire all of these.

Antony J. Williams and his colleague showed that at the moment, there are three main uses for smart phones in education. Two-dimensional barcode labels can be used to build "smart objects" on smart phones, which have built-in Web browsers that allow access to the World Wide Web's (WWW) plenty of information. When combined, these capabilities are paving the way for a future of mobile computing that may have a bigger influence on society and chemistry education than the personal computer achieved [9].

Technology has advanced as a result of chemistry as a science. Students are exposed to all facets of existence, including the study of matter, energy, and their interconnections. Engineering, as well as other fields like agricultural, biological, and environmental sciences, benefit greatly from a working grasp of chemistry [15-17].

Clinical and medical appliances like Magnetic Resonance Imaging (MRI), ultrasound machines, mass spectrometers, blood

glucose monitors, artificial joints, drug delivery systems, and DNA sequencing machines are examples of new instruments and equipment that have been produced to chemistry knowledge. The advancement of agricultural technology, the use of modern equipment, and the effects of climate change have all benefited the economy [18,19].

In the educational system, the adoption of online teaching and learning is crucial. Information and communication technology (ICT) is the term used to describe telecommunications-based technologies that enable access to information. In the educational system, using online learning and teaching is crucial. Wylie revealed that students use the majority of ICT tools and their mobile devices to support their academic work [5].

Research shows that students use social media on their mobile device for educational purposes [6]. The connectivism theory is crucial to this investigation. According to connectivism theory, internet technology gives new chances that allow people to study and share information globally [21]. Social networks and online forums with mobile devices are the instruments required to communicate this knowledge on the World Wide Web. It also depends on the Kearsley and Schneiderman engagement-based philosophy [23]. The approach placed a strong emphasis on fostering collaborative learning and engagement with educational resources, activities, and communities. It involves the students cooperating as a team to relate, produce, and provide. Similar to how communication works with mobile devices, students can talk to one another and share ideas [9].

Statement of the Problem

With the help of the internet, it is assumed that one can obtain the knowledge required for daily living because the globe has truly become a global village. This highlighted how important it is for both teachers and students to utilize mobile devices responsibly. The majority of the time, students are seen using their phones to play games, chat with friends, and chart [20,21]. Are the students aware that they can use their phones for academic purposes, such as discussing homework and obtaining online study materials? In most cases, people waste their time chatting rather than engaging in productive academic work. Could it be that they are ignorant of the fact that they can access academic resources online? Consequently, the purpose of this study is to ascertain whether undergraduate students at Kandahar University are aware of using mobile devices for learning chemistry.

Aim and Objectives

The purpose of this study is to look into how undergraduate students at the University of Kandahar in Afghanistan are using mobile devices to learn chemistry.

The specific objectives of this research are to:

1. Find out what kinds of mobile devices undergraduate chemistry students use.

2. Look into the use of mobile devices by chemistry students at the undergraduate level.
3. Find out how much knowledge university students have about using mobile devices to learn chemistry.

Research Questions

The research will be guided by the following questions.

1. What kinds of mobile devices do undergraduate students in chemistry use?
2. How do chemistry undergraduate students use mobile devices?
3. What level of knowledge do chemistry students have about using mobile devices to learn chemistry?

Methodology

The research is a descriptive survey. The sample was obtained by the use of purposeful sampling. The study involved 152 undergraduate chemistry students from the University of Kandahar in Kandahar city. Due to their small number, the 152 undergraduate chemistry students who make up the population of study serve as the sample as well. All the respondents were boys with an age range from 18 to 29 years old because girls were not allowed to go to universities. According to figure 1, the sample comprises 30% of first-year students, 22% of second-year students, 26 % of third-year students, and 22% of fourth-year students. The main tool of the study was a structured questionnaire called the "Chemistry Students Awareness and Usage of Smart Mobile Devices for Learning Questionnaire" (CSAUSMDLQ). The questionnaires were distributed during lectures or laboratory sessions to guarantee that the students have relied solely on their knowledge to answer the survey questions. Using the Cronbach Alpha statistical approach, the reliability of instrument is 0.83. It was designed by the researchers to look into undergraduate students' knowledge and use of mobile devices for learning chemistry. The instrument is divided into sections A and B. The demographic information about responders was provided in section A. In section B, information gathered from respondents regarding the sort of phones they use, their awareness of mobile devices, and how they use them to learn chemistry among undergraduates.

The type of phones respondents uses, their knowledge of mobile devices, and how they utilize their mobile devices to learn chemistry among students are all covered in part B of the report. The questionnaire items are to be answered on a modified four-point likert scale with the following responses: Strongly Agreed (SA=4), Agreed (A=3), Disagree (D=2), and Strongly Disagree (SD=1). Low Level (LL=2), Very Low Level (VLL=1), High Level (HL=3), and Very High Level (VHL=4). The weighted mean responses yield the criterion mean, which is (4+3+2+1) 4= 2.5 (Criterion mean). In order to respond to the research, the criterion mean and percentage were applied. The study focuses on the use of mobile devices in the learning of

chemistry among undergraduate chemistry students at the University of Kandahar, Afghanistan.

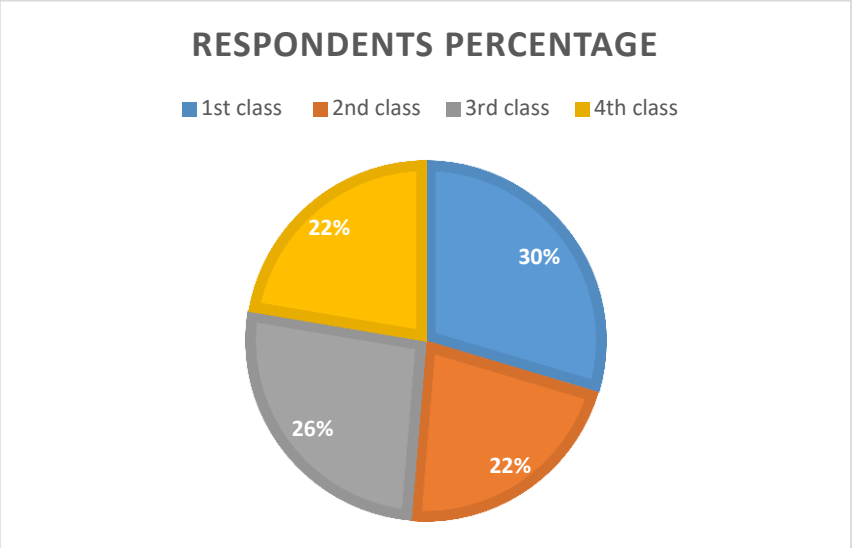

Figure 1. Percentage of the surveyed students according to their classes.

Results

Research Question 1: What types of mobile devices are being used by undergraduate chemistry students?

Table 1. Responses of students on the types of mobile devices

S/N	Items	Frequency	Percentage
1	Samsung	96	63.16%
2	Huawei	39	25.66%
3	Iphone	17	11.18%

Total number of respondents = 152

According to Table 1, the most popular smartphones among Kandahar University Undergraduate Chemistry students are Samsung (63.16%), Huawei (25.66%), and iPhone (11.18%).

Total number of respondents = 152

Research question 2: What are the ways Chemistry undergraduate students use mobile devices?

Table 2. Responses on ways in which chemistry undergraduate students use mobile devices frequencies in percentages

No	Statement	Strongly Agree	Agree	Disagree	Strongly disagree	Total score	Mean	Remarks
1	I usually download materials online for my study.	67 (44.07%)	58 (38.16%)	17 (11.18%)	10 (6.58%)	486	3.19	Accept
2	I use mobile devices to get materials for exams.	86 (56.58%)	46 (30.26%)	13 (8.55%)	7 (4.61%)	515	3.38	Accept
3	I do carryout my own research after lectures using mobile device.	63 (41.45%)	55 (36.18%)	19 (12.5%)	15 (9.86%)	470	3.09	Accept
4	Mobile devices are very effective when I am taking notes in class.	86 (56.58%)	40 (26.32%)	18 (11.84%)	8 (5.26%)	508	3.34	Accept
5	I use mobile devices to get information for my seminar and project work.	73 (48.02%)	38 (25%)	26 (17.10%)	15 (9.86%)	473	3.11	Accept
6	I use mobile devices during online courses.	31 (20.4%)	27 (17.7%)	43 (28.3%)	51 (33.5%)	342	2.25	Reject

Grand mean = 3.06
Total number of respondents = 152

According to Table 2, The majority of respondents (82.23%) strongly agree or agree that they download study materials using their mobile devices. 86.84% of respondents agree or strongly agree that they utilize their mobile devices to obtain chemistry related information for exams. In addition, 77.63% of the respondents agreed and strongly agreed on using their mobile devices for personal research after lectures. Almost 83% of respondents either strongly agree or agree with regard to utilizing a mobile device to take notes in chemistry classes. In order to gather information for seminars and projects, 73.02% of respondents strongly agree or agree that they do so. Nonetheless, 38.1% of the respondents either strongly agree or agree that they register for courses online using their mobile devices.

Research question 3: What level of knowledge do chemistry students have about using mobile devices for chemistry learning?

Table 3: responses of chemistry students at the undergraduate level regarding their level of knowledge regarding the usage of mobile devices for learning chemistry
(Frequency in percentages)

No	Statement	Strongly Agree	Agree	Disagree	Strongly disagree	Total score	Mean	Remarks
1	I am aware mobile devices can be used to do assignments.	94 (61.84%)	46 (30 %)	9 (6%)	3 (2%)	535	3.51	High level
2	Chemistry students are aware they can participate in group learning using mobile devices.	73 (48%)	55 (36.2%)	7 (4.6%)	17 (11.2%)	488	3.21	High level
3	I am aware mobile device can be used to simulate chemistry concept.	78 (51.31%)	40 (26.31%)	11 (7.23%)	23 (15.13%)	477	3.13	High level
4	Students are aware they can use mobile devices to access information and study materials anywhere in the globe.	98 (64.47%)	46 (30.26%)	5 (3.29%)	3 (1.97%)	543	3.57	Very high level
5	I am aware mobile device, can be used for research.	48 (31.52%)	44 (28.95%)	30 (19.74%)	30 (19.74)	414	2.72	High level
6	I am aware my knowledge of chemistry can increase with the use of mobile device.	94 (61.84%)	37 (24.34%)	15 (9.87%)	6 (3.95%)	523	3.44	High level
7	I am not aware that I can discuss difficult chemistry concepts with my lecturers and colleagues using mobile device.	86 (56.58%)	29 (19.08%)	23 (15.13%)	14 (9.21%)	491	3.23	Very high level

Grand mean = 3.26

According to Table 3, 91.84% of respondents are agree or strongly agree that they have of awareness regarding the use of mobile devices when completing assignments. The majority of respondents (84.2%) said that chemistry students have a good level of awareness regarding using mobile devices for group learning. 77.62% of those surveyed agreed that there is a very high level of awareness regarding the use of mobile devices to simulate chemistry topics. With regard to using mobile devices to access information and study materials anywhere in the world, 94.73% of respondents agreed that awareness among students is extremely high. The majority of the 5.22% of students who studied chemistry exclusively from library materials were in the

first class. A very high level of awareness of students using mobile devices for research was acknowledged by 60.47% of the respondents. While 39.53% of respondents do not utilize mobile devices for their study or projects, the majority of them are in first and second classes.

The usage of mobile devices has significantly enhanced chemical knowledge, according to 86.18% of the respondents. The knowledge that they might debate challenging chemistry concepts with their instructors and colleagues via a mobile device was not accepted by 75.66% of the respondents.

Discussion

Undergraduate Chemistry students at the University of Kandahar frequently use these smartphones: Samsung, Huawei, and iPhone. According to Rothaermel, attractive and novel characteristics should be taken into account by mobile device manufacturers [7]. The reason why the students are so enthusiastic about using these phones may be due to their portability, quick internet connectivity, long battery life, and potential for a wide range of services [9].

Students use mobile devices for academic purposes such as obtaining exam materials, downloading study materials from the internet, locating information for seminars and project work, and registering for online courses. Grand mean 3.06 is significantly higher than criterion mean 2.5. This supports the assertions made by [5, 9] that students use mobile devices for academic purposes.

Undergraduate students studying chemistry are very aware of the use of mobile devices for chemistry learning. The grand mean 3.26 is much higher than the criterion mean of 2.5. According to research performed by Sanchez and his colleagues, students are utilizing their mobile devices effectively for academic purposes since they are aware of the developments in the digital age [2].

Conclusion

The study demonstrates that undergraduate students at the University of Kandahar are aware of and utilize mobile devices for academic purposes and there is a chance that they could be used to learn chemistry effectively. It was found that the majority of students utilize their phones technology for academic objectives, such as downloading educational materials for projects, classwork, and assignment submission. Investigations were also conducted into the various phone models that the students were using.

Recommendations

According to the research findings, it is recommended that:

1. Students frequently use smartphones; thus the market should stock them.
2. In order to find chemical resources that are helpful for chemistry learning, students should take advantage of the benefits and opportunities offered by mobile devices.

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