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What Impedes Saudi Science Teachers from Using ICT?

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Abstract
Integration of information and communications technologies (ICT) in Saudi Arabia encounters some obstacles. This study comes to divulge the intrinsic and extrinsic barriers that impede Saudi male and female science teachers at the intermediate schools from using ICT in science pedagogy. A quantitative methodology was employed to obtain quantitative data from a 16-item questionnaire for which 309 replies were received participants. The findings confirm those reported in the literature that inefficient central project management and inadequate resources influence the integration of ICT in the science curriculum. The results of the questions on factors impeding integration of ICT differed somewhat between male and female science teachers.The study reveals that there are ten (10) main barriers that impede integration of ICT in science pedagogy in the schools of Saudi Arabia, where the Ministry of Education is called upon to deal with those obstacles and help integrate ICT in the science pedagogy.
Keywords: Saudi, science, teachers, ICT and technology

1. Introduction

As the technology proliferates, new applications appear and ICT increasingly pervades everyday life. Consequently, the knowledge and skills necessary to embrace the emerging ICT are becoming priorities for education authorities around the world (Tatto, 2006). In emerging economies such as the Kingdom of Saudi Arabia, education strategies by policymakers are expected to include ICT to prepare school leavers to seek jobs in the labour force and in the global economy. Integration of ICT into education may have the potential to bring about positive changes in the teaching and learning environments; this is a complex process. Barriers to ICT integration differ from case to case, depending on the prevailing environments of the country, society, education, school, teachers and perhaps the students. This study investigates the factors that may impede the use of ICT by the Saudi science teachers in intermediate schools (Grades 7- 9). The study is guided by the following questions:

- What are the barriers that may impede the Saudi science teachers from using ICT in the teaching and learning process?
- Do the male and female science teachers face the same barriers?
- What are the professional development needs of science teachers regarding ICT use in the science pedagogy?

This study is limited in time and place. The primary study took place in Jeddah region in 2011, and whilst there was an acceptable return rate for the survey, the overall sample represents under10 per cent of all science teachers at intermediate public schools in Saudi Arabia. Hence, the findings may be particular for the participants in this study and may not generalise to education systems and the science teacher population in other places. However, the sample did include a range of teachers, both male and female, and this will dictate whether findings are transferable to another context.

The ICT term can include computers and ancillary equipment that can calculate data and present communications in different media (Woolsey & Bellamy, 1997). Elston (2007, p.5) defines ICT globally as “the technology used to manage information and aid communication”; whilst UNESCO (2002) earlier identified ICT as computer-based elements of technology; ICT comprises computer hardware and software and communication networks (the internet). For the purposes of this study, the above definitions of ICT will be adopted.

2. Factors That May Impede the Use of ICT in Education

Researchers indicate there are numerous and diverse issues in incorporating ICT into any teaching and learning process, including both external and internal barriers to reform. Also, they noticed that barriers comprise lack of access to computers and software, insufficient time to plan instruction, lack of technical and administrative support, and limited resources. Semenov (2005) added to these factors establishment and on-going costs of providing adequate ICT for teachers. The external environment includes systems outside individual schools, such as educational districts, communities, and the larger society. Education has been often criticised for isolating itself from the local and larger society. Community engagement during technology planning with new pedagogy is believed to be an essential part of building a sustainable system (Makrakis, 2005). These points are discussed below as intrinsic and extrinsic barriers to change, and cross-cutting effects.

2.1 Intrinsic Barriers

As science pedagogy changes, pre-service teachers moving into the classroom may be the first in a school to introduce new techniques or take unconventional paths, inviting students to explore the science domain. ICT is an excellent example of this exercise in contemporary pedagogy. However, there may be a cohort of teachers who resist change and the disruption to time-honoured curriculum outcomes.

Resistance to change may be "misunderstood or simply written off as anti-progressive or technophobia" (Deetz, Tracy, & Simpson, 2000). However, there may be many factors that prevent teachers from using ICT in their teaching. Cox et al. (1999b) opine that the level of teachers' training and skills are significant factors that influence the uptake of ICT. Also, Selwyn (1997) and Tozer (1997) note that resistance to change relates to ICT anxiety through three factors: psychological, sociological, and operational.

There is arguably a causal relationship between the external and internal barriers (Jones, 2004). Jones stated that the relationship between a lack of teacher confidence and teachers' computer anxiety, and the lack of teacher competence were internal barriers or "intrinsic factors"; and the lack of access to ICT and resources were external barriers (extrinsic factors) (see figure 1)

To integrate ICT successfully into the curriculum, teachers require competency in ICT skills as well as pedagogical knowledge of effective ICT teaching practices. Intrinsic variables in computer integration include positive teaching experiences with computers; teacher's comfort with computers; beliefs supporting the use of computers as an instructional tool; training; motivation; support; and teaching efficacy (Mueller et al., 2008). Beggs (2000) and Jones (2004) found that quality of training and insufficient time as barriers that prevent teachers from integrating ICT into the classroom. Jones (p. 7) mentions that "many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of (students) who perhaps know more than they". Sub-standard ICT skills comprise factors that may include insufficient skills or inadequate pedagogical training. Moreover, the lack of time available for teachers to complete their work includes little time for preparation of the subject, for the discovery and practice of using ICT equipment, and for receiving training; these are also considered important barriers to the integration of ICT. Osborne and Hennessy (2003) note that science teachers' motivation is an important factor in introducing ICT, citing the lack of time to gain confidence with ICT, a science curriculum overloaded with content, and lack of subject-specific guidance for using ICT to support learning.

2.2 Extrinsic Barriers

Researchers note that the external barriers that prevent the teacher from using ICT in the classroom are primarily functional: lack of access to ICT and internet, insufficient time to develop courses, and ineffective training (Brush et al., 2003; Jones, 2004). Further issues cited by authors Semenov (2005), and Brush et al. relate to insufficient management and technical support, cost barriers in equipment, and that students lack skills. Jones cites functional issues of resources and access: "the lack of good ICT resources in a school will not only prevent teachers from making good use of ICT in their teaching, but it is also likely to have a detrimental effect on pupils' achievement" (p. 11). These issues are summarised in the following figure 2

3. Discipline-specific Issues:

Whilst there are generic functional barriers to integration of ICT into science education relating to resources, training, and attitudes, there are also specific science class-based issues. In Saudi Arabian science classes, Al-Mohaissin (2002) found in an early classroom study that equipment performance was unstable and frustrating for users, there was a shortage of computer software in schools, and science teachers did not distinguish between the general use of computers in schools and the use of computers in science classrooms. He also identified other barriers that prevented the effective use of ICT in science teaching as follows: the equipment used for teacher ICT training was not compatible with that found in schools as Saudi schools had limited and dated software;

- the hardware installed supported only proprietary software applications which frequently did not serve the needs of science teachers; and
- there was little Arabic software for science and that which was available was expensive.

Adding the generic to the specific, overall barriers to integrating ICT into science tended to be functional, interrelated, and differed according to the prevailing local school conditions. To summarise, issues may be classified into the following categories:

- financial barriers including hardware, software, infrastructure, and training which are relatively high in cost, especially for developing countries;
- knowledge barriers including few ICT trainers and technicians to assist teachers acquire skills;
- technical barriers, such as availability of networks or compatibility between hardware, software, and training programs; and
- intrinsic barriers, especially with teachers long experienced in traditional curricula.

3.1 Cross Cutting Effects.

In Saudi Arabia, Al-Oteawi (2002) found that there was insufficient training and courses available in colleges, particularly courses related to basic computer and internet skills; colleges of education did not at that time encourage the use of ICT in the classroom and there was little incentive in that regard for trainee teachers. Further, there was little or no professional training available for teachers to advance their ICT skills or curricula usage of ICT processes. In a recent study, the general findings of Al-Moussa (2004) and Al-Oteawi were confirmed by Oyaid (2009): time constraints, lack of training, and financial issues. Nevertheless, Oyaid's findings included that teachers' ICT use is guided by local policies: in fact, she found that teachers' ICT use was more influenced by their schools' management policy than that of the Ministry of Education. There is therefore a disconnection between the professed aims of the Ministry to integrate ICT into the science curriculum, and the attitude of a particular school management or administration that impacts ICT implementation into the curriculum (Leach & Moon, 2000).

Teacher resistance to change, whether real or perceived, is of fundamental consequence to the outcome of this study, which investigates integration of ICT in the Saudi intermediate schools' science curriculum, and teachers' professional development. If teachers cannot or will not observe the direction that the Ministry desires, then resources will be abandoned and students will not be able to improve their position in science knowledge. Barriers to reform are considered below.

These cross-cutting intrinsic, extrinsic and environmental barriers to the adoption of ICT in the science classroom have implications for schools that have the responsibility to engender knowledge and skills in their students for the job market and further education and training.

3.2 Effectiveness of ICT Integration

Student knowledge acquisition is the fundamental position for the science curriculum. Particularly in Saudi Arabia, where arts and management graduates find difficulty in achieving work in their fields, improved outcomes for science and mathematics are the ultimate goal for the Ministry of Education (2003) and to this end, it invited international scrutiny.

In 2004, the International Association for the Evaluation of Educational Achievement (IEA) released the results from its 2003 Trends in International Mathematics and Science Study (TIMSS). As global education practices evolve on the Peninsula, the comparative international standards gain credibility, and TIMSS 2003 was the fifth iteration of the IEA series, which began in the 1960s. TIMSS assesses achievement in 45 countries and includes information from students, teachers, and administrators. Although it has its detractors, TIMSS is a strong global measurement for student achievement (Wiseman, 2006). This was the first time Saudi Arabia and Bahrain entered in the assessment, with Saudi Arabia assessed at 39th in science and 43rd in mathematics. The author explains this result as indicative of a first attempt, and expected gradual improvement as the country adopts international criteria of curriculum and teacher standards.

Al-Rasbi, Al-Balushi, Al-Kharusi, Al-Harhty, and Al-Zadjali (2008) studied TIMSS 2003 data to investigate the impact of computers on Arab students' test scores in mathematics. They found that in Arab countries, including Saudi Arabia, student performance on the mathematics assessment was significantly higher in schools that had higher number of computers. In Tunisia, however, students taught in schools with only a few computers achieved significantly higher achievement scores. Interestingly, in Bahrain, Egypt, Jordan, Lebanon, and Saudi Arabia, students using computers inside the school outperformed students using computers outside the school. Students who had access to computers during mathematics lessons in TIMSS classes in five Arab countries including Saudi Arabia scored at a higher level than the students in these countries who did not have access to computers during their mathematics lessons. The result of this study appeared to be that science students in Saudi Arabia lacked the rigour of Tunisian schools; arguably, students using computers in class rather than home were more focussed on the use of ICT as a tool rather than for entertainment; however, in general, Saudi students using computers for mathematics lessons performed better than those who used pen and paper. It is open for discussion; however, the results could also be relevant for science examinations.

The TIMSS results are indicators of the Saudi government's intent to gain international recognition for its graduates. The initial attempt is expected to improve as the education system matures and standards begin to deliver improved performances from the teaching and learning experiences.

4. Methodology of the Study

Quantitative research is a type of educational research that relies on the collection of data subject to quantitative analysis. It is generally a means for testing objective theories by examining the relationship among variables (Creswell, 2009; Johnson & Christensen, 2004). The researcher in quantitative research often "decides what to study, asks specific, narrow questions, collects quantifiable data from participants, analysing these numbers using statistics; and conducts the inquiry in an unbiased, objective manner" (Creswell, 2008, p.46)

Quantitative analysis was used in this study for the science teacher questionnaire distributed to a large number of male and female science teachers at the intermediate boys' and girls' schools. The questionnaire

aimed to identify the barriers that may hinder teachers from exploiting the resources available through ICT. To achieve the objective of this study, data was collected directly from the teachers through a questionnaire designed to address the main objectives of the research. The data from questionnaire may be analysed through descriptive analysis, described by Sarantakos (2005, p.300) as a "type of analysis that aims at identifying and describing the main content of data". Quantitative data offers useful information if the researcher needs to describe a large population (Creswell, 2005). According to Johnson and Christensen (2004), a questionnaire is a self-reporting data collection instrument that each research participant fills out as part of a research study.

Designed questionnaire is simple and directly to achieve the objectives of the study. Questionnaire included 16 questions, the first question was to determine the gender of the participant (male or female), and the rest of the 15 questions were about the barriers that may impede science teachers from integrating ICT in the teaching and learning process. A four-point Likert Scale ("does not limit" to "greatly limits") was used for this series. The data from the returned questionnaires was coded and entered into the Statistical Package for Social Science (SPSS). Williamson (2002) advises that the code ascribed to each question in the survey should be simple and easy to use. To analyse Q1, summary statistics were applied, such as the average of the frequencies and percentages, to describe the responses of the participants. In the next 15 questions which address the barriers to integration of the ICT into science teaching, the responses, "strongly agree" and "agree" were merged and collected into one column; as were the options, "disagree" and "strongly disagree". The lack of 'strong' statements was again the reason for the mergers. The barriers were then ranked based on the means.

5. Results and Discussion

There were 646 questionnaires delivered to the Educational Supervision Centres for boys and girls in the Jeddah region, with 340 questionnaires returned and 309 found to be complete. There were roughly equal numbers of males and female participants in the first question part of the study (from 148 men and 161 women teachers). The fifteen factors which likely to impede ICT integration, and through extrapolation, teachers in the Ministry of Education, Saudi Arabia. Participants responded on a four-part Likert scale (does not limit = 1, slightly limits = 2, somewhat limits = 3, and greatly limits = 4) for each factor. To analyse these factors, a selection of descriptive values: frequencies, means, rank, and standard deviations are employed for participants' responses. Further, male and female teachers' responses are ranked and compared to highlight differences (see table 1).

The results of the questions on factors impeding integration of ICT (table 1) differed somewhat between male and female science teachers. The results indicate that the highest mean for male teachers was 3.38 on barrier (Q2), shortage of ICT equipment at school. This value is the mean equal to 84.5 per cent of the maximum (4) score. The lowest average means was 1.89 on Q15 concerns of ICT competency in class situation, which is less than the midpoint of this scale. The results for the female teachers were the highest average means of 3.25 on Q16, insufficient time to acquire ICT skills, which is 81.25 per cent of the maximum score. The lowest mean for the female teachers was 2.02 on Q15, as it was for the male teachers. Otherwise, there are similarities among the top five barriers to the integration of ICT into science between male and female teachers (Q2, Q3, Q4, Q5, and Q13), although different in ranking.

There are 15 factors perceived by the teachers in the survey as barriers to using ICT in science classes and table 2 is a statistical summary of these factors. Based on the mean value of each barrier, the participants converged on ten as the strongest obstacles.

As analysis of table 2 shows, the ten primary barriers impeding ICT implementation in Jeddah's intermediate science classes are identified and discussed below.

1. Q13 Insufficient time in the weekly schedule to acquire ICT skills. The results from the participants place this as the strongest barrier that limits science teachers in using ICT in science classes, as more than 91 per cent of participants (283) reported this as a limiting factor. Over half nominated it as their greatest concern; while just 8 per cent (9 male and 17 female teachers) stated that time was not of concern.
2. Q2 Shortage of ICT equipment at school. This factor shows that the greater majority of teachers (280) reported inadequate ICT equipment limited their ability to use ICT, with over half the respondents reporting that it significantly limited their ability to use ICT in the science classroom. This factor ranked first for male teachers and as a second-level issue for female teachers.
3. Q5 Large numbers of students in classes limit the use of ICT. Respondents report a high average number of students. This factor of class sizes as a limiting factor ranked third for men and fifth for women teachers. Slightly less than one half of respondents gave this as of great concern, with over 80 per cent declaring it a significant limiting factor. This may be linked to the following item.
4. Q4 Lack of sufficient room to use ICT in the classroom. This item ranked fourth as a barrier for both male and female teachers. Table 2 shows that 88 per cent of science teachers agreed on the space barrier (slightly, somewhat, and greatly limiting); whilst the remainder had no such concern. Whilst insufficient

room is a significant barrier for a percentage of respondents who are accommodated in purpose-built schools, there may be space limitations in older Ministry school buildings, which become overcrowded due to population pressure.

5. Q3 Insufficient technical support for using ICT. This factor was of immediate concern to both genders, with 125 male and 136 female teachers (85%) referring to higher limitations (somewhat and greatly limiting) on ICT integration due to the lack of technical support for using ICT, while just 21 reported they experienced no limit.
6. Q12 There is no plan to introduce ICT in the school. Seventy-six per cent of teachers noted this as a high limitation to integrating ICT into their science curricula. Men and women respondents were relatively equal in this result.
7. Q7 Internet speed is not suitable educational usage. Dial-up connection is the predominant method of internet connectivity in Saudi Arabia, thus 71 per cent (210 respondents) were quite concerned or highly concerned on the perceived barrier to use through speed of connection and waiting time for screens to load.
8. Q6 Internet connection is not available. The Ministry of Education began connecting schools to the internet in 2003. For this question, 19 male and 23 female science teachers said that a lack of internet connection did not limit ICT usage, whilst three-quarters of the sample showed considerable concern. Due to the number of respondents who were also affected by internet speed, it is likely that this high response to unavailability relates to specific instances, or arguably, that a land line is not available for a dial-up internet connection.
9. Q16 Inadequate ICT training pre-service. Three-quarters of respondents, 229, reported that insufficient pre-service training impacted their ability to use ICT in the science classroom. One quarter of the respondents were therefore not affected or mildly affected by inadequate training before they started to teach. Slightly more women reported a higher concern (120) than men teachers (109).
10. Q9 There are no Arabic software programs.For this question, nearly 90 per cent of the participants (277) reported the limited number of Arabic software programs that related to science education impeded integration of ICT into science education. Whilst the curriculum includes English subjects in intermediate schools, fluency is not expected in scientific vocabulary. Thus there is a need for translation or Arabic-dubbed programs.

In general, the average of the means for all 15 questions was higher than the midpoint of a 4-point scale, with the exception of Q15 Concerns of ICT competency in class. This result shows a considerable number of perceived barriers that impeded teachers from using ICT in their science classes; however, there was little difference in the perceptions of the teachers in boys' schools, and those in the girls' schools. All had basically the same concerns.
Whilst broadly in concert, there was differentiation in the ranking by the genders as indicated by Table 3, which compares gender perceptions on issues which impede integration of ICT. The most highly ranking issues for both genders merit particular attention: time to acquire ICT skills, ICT resources, teachers' ICT competency levels, technical support, availability of the internet, and the availability of Arabic software.

5. Conclusion

Issues regarding impediment of integration of ICT are complex and multiple dimensional. The study reveals that there are ten (10) main barriers that impede integration of ICT in science pedagogy in the schools of Saudi Arabia. In addition, the study discloses that there are differences in ranking of barriers between the male and female teachers. Correspondingly, there is a need to give a particular attention by the Ministry of Education to the top barriers such as : time to acquire ICT skills, ICT resources, teachers' ICT competency levels, technical support, availability of the internet, and the availability of Arabic software to achieve effectiveness of ICT integration.

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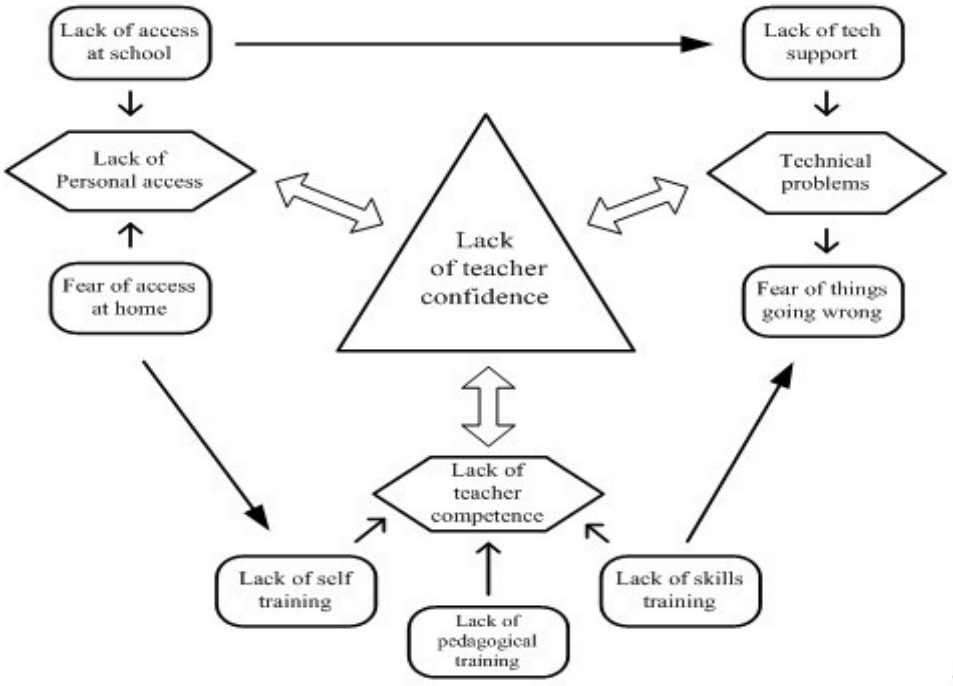
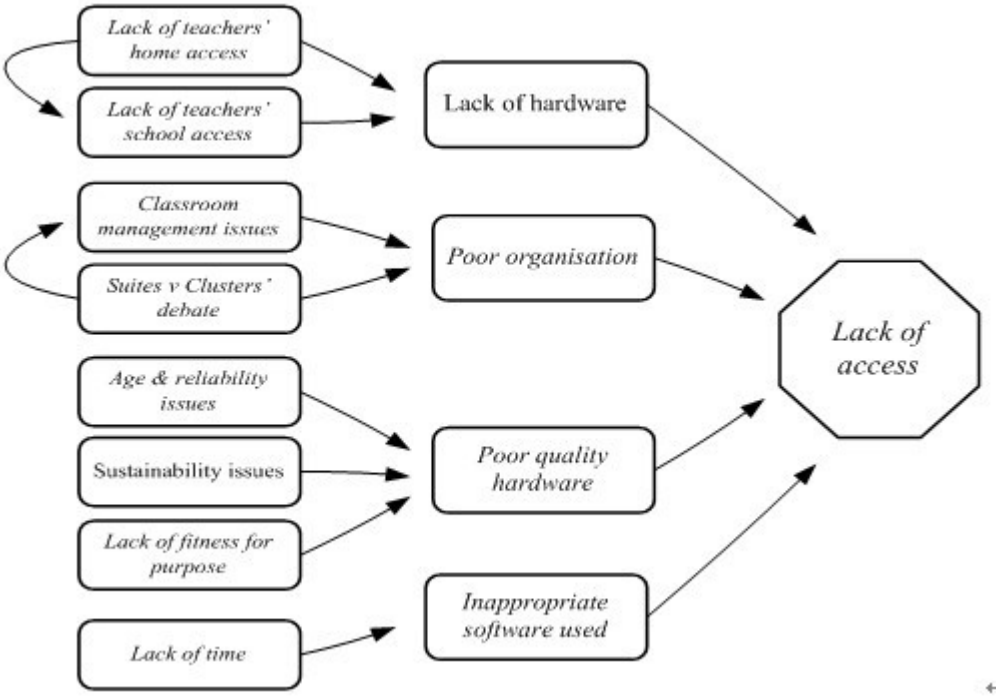


Source: Jones, 2004, p.21.

Figure 1 Adoption of ICT: Intrinsic and Extrinsic Factors



Source: Jones, 2004, p.22.

Figure 2 Issues Regarding Access to ICT Resources

Table 1: Ranking of Factors Impeding Integration of ICT into Science Pedagogy

Q	Factors	Gender	N	Mean	Rank	Std D
Q2	Shortage of ICT equipment at school	Male	148	3.38	1	.876
		Female	161	3.23	2	.963
		Total	309	3.30	2	.924
Q3	Insufficient technical support for using ICT	Male	148	3.14	5	.825
		Female	161	3.16	3	.863
		Total	309	3,15	5	.844
Q4	Insufficient space to use ICT in classes	Male	148	3.16	4	.990
		Female	161	3.14	4	1.012
		Total	309	3.15	4	1.000
Q5	Large class numbers limits use of ICT	Male	148	3.36	3	.841
		Female	161	3.07	5	1.070
		Total	309	3.21	3	.976
Q6	Internet connections are not available	Male	148	3.06	7	1.018
		Female	161	2.93	8	1.040
		Total	309	2.99	8	1.030
Q7	Internet speed is not suitable for use in education	Male	148	3.03	9	.922
		Female	161	2.98	7	.928
		Total	309	3.00	7	.924
Q8	Limited number of Arabic web sites	Male	148	2.82	12	1.035
		Female	161	2.88	11	.907
		Total	309	2.85	12	.969
Q9	There are no Arabic software programs	Male	148	3.05	8	.906
		Female	161	2.78	12	.968
		Total	309	2.91	10	.947
Q10	The science curriculum is not suitable for using ICT	Male	148	2.47	13	1.000
		Female	161	2.26	14	1.070
		Total	309	2.36	14	1.040
Q11	Extensive science curriculum for completion in year	Male	148	2.85	11	1.096
		Female	161	2.89	10	1.121
		Total	309	2.87	11	1.100
Q12	No plan to introduce ICT in the school	Male	148	3.12	6	.790
		Female	161	3.06	6	.920
		Total	309	3.09	6	.859
Q13	Insufficient time in schedule to acquire ICT skills	Male	148	3.37	2	.851
		Female	161	3.25	1	.964
		Total	309	3.31	1	9.120
Q14	Technical constraints in using ICT	Male	148	2.45	14	1.139
		Female	161	2.66	13	1.018
		Total	309	2.56	13	1.081
Q15	Concerns of ICT competency in class situation	Male	148	1.89	15	1.064
		Female	161	2.02	15	1.060
		Total	309	1.96	15	1.620
Q16	Insufficient pre-service teacher training in ICT	Male	148	2.95	10	1.061
		Female	161	2.89	9	1.058
		Total	309	2.92	9	1.050

Table 2: Barriers for Integration of ICT into Science pedagogy

Factor	Gender	Does not limit		Slightly limits		Somewhat limits		Greatly limits	
		Freq	%	Freq	%	Freq	%	Freq	%
Q2Shortage of ICT equipment at school	Male	11	3.56	6	1.94	47	15.21	84	27.18
	Female	18	5.83	6	1.94	58	18.77	79	25.57
	Total	29	9.39	12	3.88	105	33.98	163	52.75
Q3Insufficient technical support for using ICT	Male	9	2.91	14	4.53	72	23.30	53	17.15
	Female	12	3.88	13	4.21	74	23.95	62	20.06
	Total	21	6.80	27	8.74	146	47.25	115	37.22
Q4 Insufficient space to use ICT in classes	Male	17	5.50	11	3.56	51	16.50	69	22.33
	Female	21	6.80	9	2.91	57	18.45	74	23.95
	Total	38	12.30	20	6.47	108	34.95	143	46.28
Q5d Large class numbers limit use of ICT	Male	7	2.27	14	4.53	46	14.89	81	26.21
	Female	25	8.09	11	3.56	52	16.83	73	23.62
	Total	32	10.36	25	8.09	98	31.72	154	49.84
Q6 Internet connection is not available	Male	19	6.15	15	4.85	52	16.83	62	20.06
	Female	23	7.44	24	7.77	56	18.12	58	18.77
	Total	42	13.59	39	12.62	108	34.95	120	38.83
Q7 Internet speed is not suitable for educational usage	Male	10	3.24	30	9.71	53	17.15	55	17.80
	Female	11	3.56	38	12.30	56	18.12	56	18.12
	Total	21	6.80	68	22.01	109	35.28	111	35.92
Q8 Limited number of Arabic web sites	Male	21	6.80	31	10.03	49	15.86	47	15.21
	Female	17	5.50	26	8.41	78	25.24	40	12.94
	Total	38	12.30	57	18.45	127	41.10	87	28.16
Q9 No Arabic software programs	Male	10	3.24	27	8.74	57	18.45	54	17.48
	Female	22	7.12	31	10.03	69	22.33	39	12.62
	Total	32	10.36	58	18.77	126	40.78	93	30.10
Q10 Science curriculum not suitable for ICT	Male	28	9.06	49	15.86	44	14.24	27	8.74
	Female	55	17.80	30	9.71	55	17.80	21	6.80
	Total	83	26.86	79	25.57	99	32.04	48	15.53
Q11 Extensive science curriculum for year	Male	29	9.39	14	4.53	55	17.80	50	16.18
	Female	33	10.68	11	3.56	57	18.45	60	19.42
	Total	62	20.06	25	8.09	112	36.25	110	35.60
Q12 No plan to introduce ICT in the school	Male	4	1.29	26	8.41	66	21.36	52	16.83
	Female	10	3.24	33	10.68	55	17.80	63	20.39
	Total	14	4.53	59	19.09	121	39.16	115	37.22
Q13 Insufficient time to acquire ICT skills	Male	9	2.91	9	2.91	48	15.53	82	26.54
	Female	17	5.50	8	2.59	53	17.15	83	26.86
	Total	26	8.41	17	5.50	101	32.69	165	53.40
Q14 Technical constraints in using ICT	Male	42	13.59	32	10.36	39	12.62	35	11.33
	Female	32	10.36	23	7.44	73	23.62	33	10.68
	Total	74	23.95	55	17.80	112	36.25	68	22.01
Q15 Concerns of ICT competency in class	Male	75	24.27	31	10.03	25	8.09	17	5.50
	Female	73	23.62	26	8.41	47	15.21	15	4.85
	Total	148	47.90	57	18.45	72	23.30	32	10.36
Q16 Insufficient pre-service training in ICT	Male	24	7.77	15	4.85	54	17.48	55	17.80
	Female	29	9.39	12	3.88	67	21.68	53	17.15
	Total	53	17.15	27	8.74	121	39.16	108	34.95

Table 3: Impediment Ranking to ICT Integration: Gender Comparison

Ranking	Male science teachers	Female science teachers
1	Shortage of ICT equipment	Insufficient time in the weekly schedule to acquire ICT skills
2	Insufficient time in the weekly schedule to acquire ICT skills	Shortage of ICT equipment
3	Large numbers of students in classrooms	Insufficient technical support
4	Small classrooms	Small classrooms
5	Insufficient technical support	Large class numbers
6	There is no plan to improve ICT in the school	There is no plan to improve ICT in the school
7	Internet connections are not available	Internet speed is not suitable
8	There are no Arabic electronic software programs	Internet connections are not available
9	Internet speed is not suitable	Insufficient ICT training for pre-service teachers
10	Insufficient ICT training for pre-service teachers	Time constraints from extensive science curriculum
11	Time constraints from extensive science curriculum	Limited number of Arabic web sites
12	Limited number of Arabic web sites	There are no Arabic electronic software programs
13	The science curriculum is not suitable for using ICT	Concerned of ICT equipment failure
14	Concerned of ICT equipment failure	The science curriculum is not suitable for using ICT
15	Afraid of failure in using ICT in front of students	Afraid of failure in using ICT in front of students