**Issues and challenges in teaching with ICT tools**

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**Abstract**

In this pandemic COVID and digital era, ICT tools gives a lot of opportunities to utilise and learn the skills among students, student to teacher interaction etc. Therefore studying issues and challenges related to ICT tools in teaching and learning as become a major issues in this era and to overcome this ICT tools must be assist to teachers ,hence become successful technology users ..thus, the main key point is to study and analyse teachers perception of the challenges faced using ICT tools in classrooms. The major issues found by teachers were technical support, limited network and accessibility, training etc. thus this paper purpose to overcome the issues and challenges faced through ICT tools.

**Keywords**: ICT tools, teaching and learning, challenges and issues.

**Introduction**

The **Information and Communication Technology (ICT)** is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning.

ICT tools like apps, programs and web2.0 applications are part of our modern society. Schools all over Europe are adopting this essential trend, but in many countries this adoption is happening at a rather slow pace. This has many reasons, from missing infrastructure to security concerns to teachers not being familiar enough with using ICT in regular classes. To encourage teachers to think about an increased use of ICT tools in teaching, and to inspire them on where and how to use these tools is the main idea of this ICT Guide. We need well-educated students with profound ICT skills – in terms of operation as well as media literacy – to become active members of our knowledge society which is built on the foundation of ICT in most areas these days.

The aim of this guide is to practically support teachers in using ICT tools in class. A special focus is laid on integrating various tools in inquiry-based science education (IBSE): on the one hand, this type of teaching allows for a multitude of different opportunities for integrating ICT, on the other hand, it is one of the foci of the EU project IRRESISTIBLE in which this guide was developed.

This guide is an updated and considerably improved version of the Web2.0 / App Guide published in an early phase of the IRRESISTIBLE project (March 2014). While the first guide mainly focused on listing selected tools that could be integrated in IBSE teaching, this guide goes a step further by analyzing the application of tools in the IRRESISTIBLE teaching modules and offering many examples of practical integration of ICT tools in teaching

**Literature Review**

Information and communications technology (ICT) is an important part of most organizations these days(Zhang & Aikman, 2007). Computers began to be used in schools in the early 1980s, and several cholars suggest that ICT will be an important part of education for the next generation (Bransford, Brown, & Cocking, 2000; Grimus, 2000; Yelland, 2001). Up‐to‐date technology offers many methods of enhancing classroom teaching and learning (Ghavifekr et al., 2014; Lefebvre, Deaudelin & Loiselle, 2006). Dawes(2001)stated  that new technologies have the potential to upkeep education across the curriculum and deliver opportunities for efficient student‐teacher communication in ways not possible before. ICT in education has the potential to transform teaching. However, this potential may not easily be realized, as Dawes (2001) underlined when he stated, “problems arise when teachers are expected to implement changes in what may well be adverse circumstances” (p. 61).

Due to ICT’s importance in society as well as in the future of education, identifying the possible challenges to integrating these technologies in schools would be an important step in improving the quality of teaching and learning. Balanskat, Blamire, and Kefala (2006) argue that although teachers appear to acknowledge the value of ICT in schools, they continue encountering obstacles during the processes of adopting these technologies into their teaching and learning.

Students with disabilities have, then, the right to expect the same standard of education as their schoolmates and, in this view, they also have the right to access and use mainstream educational tools, including ICT based ones, which are generally referred to as “e-learning tools”.

Such tools are worldwide considered powerful tools to foster learning [Hitchcock et al., 2003] but, at the same time, it is well known that, due to the widespread use of technological tools, “disadvantaged or excluded groups, including the unskilled, disabled and the elderly, face the danger of further marginalization ”, in fact, “with the advent of the digital computer, and its broad penetration , disabled and elderly people face serious problems in accessing computing devices” [Stephanidis and Savidis, 2001] Anderson [2006] underlines that, in the field of education, “while technologies are beneficial and have been shown to help with educational tasks, their design and usability are an issue”.

Therefore, this study is expected to generate information on the teachers’ perceptions and challenges of integrating ICT tools in the teaching and learning process. With changes in modern technologies learners need to be equipped with updated knowledge that will help them adapt to the changing world. Such knowledge leads to better communication and increased 21st century skills as a result of e‐Commerce and self‐employment in the ICT sector.

Many studies have been conducted to investigate the challenges to technology integration in education (Al‐Alwani, 2005; Ghavifekr , Afshari & Amla , 2012; Gomes, 2005; Osborne & Hennessy, 2003; Özden, 2007). This study provides teachers’ perception and perceived barriers to the use of technology tools in classroom’s teaching and learning process. Therefore, the main objectives of this study are as follow:

1. To identify school teachers’ perceptions in implementing ICT tools in teaching and learning in classroom.
2. To determine the challenges of using ICT tools in teaching and learning in the classroom among school teachers.
3. To identify that to what extent do teachers use ICT tools in teaching and learning in the classroom.   However, in this paper ICT tools refers to the common technology‐based tools that are using in schools such as computer, Laptop, LCD, digital photocopy machine, digital Audio and Video devices, digital camera, scanner, DVD player and multimedia projector.

**Challenges in using ICT in teaching and learning**

Fig1: challenging issues in teaching with ICT tools

External Variables – It represents the challenges that teachers face that come from outside their sphere of control when integrating a new technology in their teaching and learning process.  These challenges include

1. Limited accessibility and network connection
2. Schools with limited ICT facilities
3. Lack of effective training
4. Limited time
5. Lack of teachers’ competency

**Perceived usefulness** – It represents the degree to which they believe that using a particular technology would enhance their job performance. If teachers feel there is no need to question or change their professional practice then, according to studies, they are unlikely to adopt the use of ICT tools. However, if they perceive ICT to be useful to them, their teaching and their pupils’ learning, then according to the empirical evidence of previous studies (Cox, Preston & Cox, 1999) they are more likely to have a positive attitude to using ICT in the classroom. The following factors have been identified as key elements to teachers’ perceived usefulness of ICT tools:

1. Work more quickly
2. Job performance
3. Increased productivity
4. Effectiveness
5. Useful

**Perceived ease‐of‐use**– It represents the degree to which they believe that using a particular system would be free from effort. Previous studies have identified a number of factors relating to the perceived ease of use of ICT, in study on experienced practicing ICT users. The Impact project (Watson, 1993) and other studies identified a wide range of skills and competencies which teachers felt they needed in order to find ICT easy to use. Some of these are:

1. Easy to learn
2. Clear and understandable
3. Easy to use
4. Controllable
5. Easy to remember

**Attitude toward use** – teacher’s positive or negative feeling about performing the target behaviour (e.g., using a system).  Basically, teachers’ attitudes too many of these factors will depend upon how easy they perceive using ICT tools to be on a personal level as well as for teaching in the classroom.

**Behavioural intention** ‐ The degree to which the teacher has formulated conscious plans to perform or not perform some specified future behaviour.

Social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) as determinants of perceived usefulness and usage intentions.

Basically, the updated version of TAM 2 consists of additional determinants that are social influence process and cognitive instrumental processes of perceived usefulness and usage intentions.

Integrating ICT into teaching and learning is a complex process and one that may encounter a number of difficulties. These difficulties are known as “challenges” (Schoepp, 2005). A challenge is defined as “any condition that makes it difficult to make progress or to achieve an objective” (WordNet, 1997, as cited in Schoepp, 2005, p. 2). The following are some of the key challenges that have been identified in the literature regarding teachers’ use of ICT tools in classroom.

a) **Limited accessibility and network connection** -Several research studies indicate that lack of access to resources, including home access, is another complex challenge that prevent teachers from integrating new technologies into education. Various research studies indicated several reasons for the lack of access to technology.

In Sicilia’sstudy (2005), teachers complained about how difficult it was to always have access to computers. The author gave reasons like “computers had to be booked in advance and the teachers would forget to do so, or they could not book them for several periods in a row when they wanted to work on several projects with the students” (p. 50). In other words, a teacher would have no access to ICT materials because most of these were shared with other teachers. According to Becta (2004), the inaccessibility of ICT resources is not always merely due to the non‐availability of the hardware and software or other ICT materials within the school. It may be the result of one of a number of factorssuch as poor resource organization, poor quality hardware, inappropriate software, or lack of personal access for teachers (Becta, 2004).

The challengesrelated to the accessibility of new technologiesfor teachers are widespread and differ from country to country. Empirica’s (2006) European study found that lack of access is the largest barrier and that different challenges to using ICT in teaching were reported by teachers, for example a lack of computers and a lack of adequate material. Similarly, Korte and Hüsing (2007, p. 4) found that in European schoolsthere are some infrastructure barriers such as broadband access not yet being available. They concluded that one third of European schools still lack broadband Internet access. Pelgrum (2001) explored practitioners’ views from 26 countries on the main obstacles to ICT implementation in schools. He concluded that four of the top ten barriers were related to the accessibility of ICT. These barriers were insufficient unit of computers, insufficient peripherals, insufficient numbers of copies of software, and insufficient immediate Internet access. Toprakci (2006) found that low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software in the school were barriers to the successful ICT implementation in Turkish schools. Similarly, Al‐Alwani (2005) found that having no access to the Internet during the school day and lack of hardware were hampering technology integration in Saudi schools. Recent research on Syrian schools indicated that insufficient computer resources were one of the greatest impediments to technology integration in the classroom (Albirini, 2006).

b) **School with limited technical support** -Without both good technical support in the classroom and whole‐school resources, teachers cannot be expected to overcome the obstacles preventing them from using ICT (Lewis, 2003). Pelgrum (2001) found that in the view of primary and secondary teachers, one of the top barriers to ICT use in education was lack of technical assistance.

In Sicilia’s study (2005), technical problems were found to be a major barrier for teachers. These technical barriers included waiting for websites to open, failing to connect to the Internet, printers not printing, malfunctioning computers, and teachers having to work on old computers. “Technical barriers impeded the smooth delivery of the lesson or the natural flow of the classroom activity” (Sicilia, 2005, p. 43). Korte and Hüsing (2007) argued that ICT support or maintenance contracts in schools help teachers to use ICT in teaching without losing time fixing software and hardware problems. The Becta (2004) report stated “if there is a lack of technical support available in a school, then it is likely that technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns” (p. 16). Many of the respondents to Becta’s survey (2004) indicated that technical faults might discourage them from using ICT in their teaching because of the fear of equipment breaking down during a lesson. In teaching, several studies indicated that lack of technical support is a main barrier to using technologies. According to Gomes (2005), ICT integration in teaching needs a technician and if one is unavailable the lack of technical support can be an obstacle. In Turkey, Toprakci (2006) found that the lack of technical support was one of two significant barriersto ICT integration in science education in schools and might be considered “serious”. In Saudi Arabia, science teachers would agree to introduce computers into teaching, except that they believe they will encounter problems such as technical service or hardware problems (Almohaissin, 2006). Sicilia (2005) argued that whatever kind of technicalsupport and accessteaching staff have and whether they have twenty years of experience or are novices to the profession, technical problems generate barriers to the smooth lesson delivery by teachers.

c) **Lack of effective training-** The challenge most frequently referred to in the literature is lack of effective training (Albirini, 2006; Balanskat et al., 2006; Beggs, 2000; Özden, 2007; Schoepp, 2005; Sicilia, 2005; Toprakci, 2006; Ghavifekr & Wan Athirah, 2015). One finding of Pelgrum’s (2001) study was that there were not enough training opportunities for teachers in using ICTs in a classroom environment. Similarly, Beggs (2000) found that one of the top three barriers to teachers’ use of ICT in teaching wasthe lack of training. Recent research in Turkey found that the main problem with implementing new ICT in education was the insufficient amount of in‐ service training for teachers (Özden, 2007), and Toprakci (2006) concluded that limited teacher training in ICT use in Turkish schools is an obstacle. According to Becta (2004), the issue of training is certainly complex because it is important to consider several componentsto ensure training effectiveness. These were time for training, pedagogical training,skills training, and an ICT use in initial teacher training. Correspondingly, recent research by Gomes (2005) relating to various subjects concluded that lack of training in digital literacy, lack of pedagogic and didactic training in how to use ICT in the classroom and lack of training concerning technology use in specific subject areas were obstaclesto using new technologiesin classroom practice. Some of the Saudi Arabian studiesreported similar reasons for failures in using educational technology: the weakness of teacher training in the use of computers, the use of a “delivery” teaching style instead of investment in modern technology (Alhamd, Alotaibi, Motwaly, & Zyadah, 2004), as well as the shortage of teachers qualified to use the technology confidently (Sager, 2001). Providing pedagogical training for teachers, rather than simply training them to use ICT tools, is an important issue (Becta, 2004). Cox et al. (1999a) argue that if teachers are to be convinced of the value of using ICT in their teaching, their training should focus on the pedagogical issues. The results of the research by Cox et al. (1999a) showed that after teachers had attended professional development courses in ICT they still did not know how to use ICT in their classrooms; instead they just knew how to run a computer and set up a printer. They explained that this is because the courses only focused on teachers acquiring basic ICT skills and did not often teach teachers how to develop the pedagogical aspects of ICT. In line with the research by Cox et al. (1999a), Balanskat et al. (2006) indicated that inappropriate teacher training is not helping teachers to use ICT in their classrooms and in preparing lessons. They assert that this is because training programs do not focus on teachers’ pedagogical practices in relation to ICT but on developing ICT skills.

d) **Limited time** -Several recent studies indicate that many teachers have competence and confidence in using computers in the classroom, but they still make little use of technologies because they lack the time. A significant number of researchers identified time limitations and the difficulty in scheduling enough computer time for classes as a barrier to teachers’ use of ICT in their teaching (Al‐ Alwani, 2005; Becta, 2004; Beggs, 2000; Schoepp, 2005; Sicilia, 2005). According to Sicilia (2005), the most common challenge reported by all the teachers was the lack of time they had to plan technology lessons, explore the different Internet sites, or look at various aspects of educational software. Becta’s study (2004) found that the problem of lack of time exists for teachers in many aspects of their work as it affects their ability to complete tasks, with some of the participant teachers specifically stating which aspects of ICT require more time. These include the time needed to locate Internet advice, prepare lessons, explore and practise using the technology, deal with technical problems, and receive adequate training.

e) **Lack of teachers** competency Another challenge directly related to teacher confidence is teachers’ competence in integrating ICT into pedagogical practice (Becta, 2004). In Australian research, Newhouse (2002) found that many teachers lacked the knowledge and skills to use computers and were un enthusiastic about the changes and Current research has shown that the level of this barrier differs from country to country.

In the developing countries, research reported that teachers’ lack of technological competence is a main barrier to their acceptance and adoption of ICT (Pelgrum, 2001; Al‐Oteawi, 2002). In Syria, for example, teachers’ lack of technological competence has been cited as the main barrier (Albirini, 2006). Likewise, in Saudi Arabia, a lack of ICT skills is a serious obstacle to integration of technologies into science education (Al‐Alwani, 2005; Almohaissin, 2006). Empirica (2006) produced a report on ICT use in European schools. The data used for the report came from the Head Teachers and Classroom Teachers Survey carried out in 27 European countries. The findings show that teachers who do not use computers in classrooms claim that “lack of skills” are a constraining factor preventing them from using ICT for teaching. Another worldwide survey conducted by Pelgrum (2001), of nationally representative samples of schools from 26 countries, found that teachers’ lack of knowledge and skills is a serious obstacle to using ICT in primary and secondary schools. The results of a study conducted by Balanskat et al. (2006) have shown that “in Denmark ... many teachers still chose not to use ICT and media in teaching situations because of their lack of ICT skills rather than for pedagogical/didactics reasons” while “in the Netherlands ... teachers’ ICT knowledge and skills is not regarded any more as the main barrier to ICT use” (p. 50). Hence, lack of teacher competence may be one of the strong barriers to integration of technology into education. It may also be one of the factors involved in resistance to change.

**Different E-Learning Tools for Different Visual Needs**

While affording the choice of the e-learning tools to be used in concrete educational settings by visually impaired students, from one side, it is important to consider the nature, the specific features and the functionalities of the technological tools at hand; from the other side, it is necessary to take into account the actual, specific needs of the potential user/s (which are, of course, related to their impairments). To this end, in the following, an overview and a basic classification of the main tools used in the field of e-learning is proposed; subsequently, a quick look is taken to the different needs of the different categories of visually impaired students and to the main obstacles that they may encounter.

What Do We Exactly Mean with the Term “E-Learning Tools”?

Anohina, [2005] defines “e-learning” as a learning process that “takes places via any electronic medium”. In a global perspective, such a term refers, then, to any educational process making use of technological/electronic media and applications such as: “web-based teaching materials, hypermedia in general, multimedia CDROMs, web sites, discussion boards, collaborative software, e-mail, blogs, wikis, computer aided assessment, educational animation, simulations, games, learning management software, etc…” [Wikipedia]

Fig2. E-Learning Tools for Different Visual Needs

I)“**Online learning**”: those educational resources made available through interconnected computer networks, comprising also synchronous and asynchronous communication tools, when used in an educational perspective.

II) “**Computer-based learning**”: those learning materials locally available on the user’s PC and used when the computer is not connected to a network.

III)“**M-learning**”: those educational tools made available through “mobile devices” such as palmtops (or handhelds), Personal Digital Assistants (PDAs), tablet PCs, mobile or smart phones; such tools, may also take advantage of the connection to the net via “wireless transmission” [Hoppe et al, 2003].

The concept of “e-learning tool” is, then, linked both to the media (hardware devices) employed and to the programs (software applications) used to support the educational process. Such software applications can be roughly divided into:

E-learning platforms: those internet-based environments expressly addressed to the delivery of integrated electronic educational contents and to the management of a variety of educational activities aimed at fulfilling specific educational objectives

[Lin and Kuo, 2005]. All the digital contents made available by and through such platforms, are generally called “learning objects”.

1. Web based applications: those applications (both designed for educational purposes and used to fulfil educational objectives) which are directly accessible using any available browser and which don’t need to be installed on the user PC. II)
2. Standalone applications: those products (both “educational” and “used for education”) which cannot be used directly via browser but that need to be installed locally, on the user machine; this category includes also products “downloadable” from the Web, but that still need to be installed on the computer.

E-Learning Tools and the Needs of Visually Impaired Students

Examples of what kind of accessibility and usability problems can be found in the different categories of software applications are provided in the following, keeping aside, for the moment, all the possible problems linked to the use of computers in their standard configuration and of other specific hardware devices. While considering such obstacles, it is important to reflect on the fact that they are strictly related to the type of user impairment. Blind and low vision students encounter different types of obstacles: in order to fully to access the contents, in fact, the first category needs necessarily to rely on screen readers, while the second category, thanks to optical aids and/or to specific customization options, may access a much wider variety of software applications, including, often, those with graphic interface. Other significant differences can be found among the needs of the different categories of low vision students due to the wide variety of their visual impairments [Dini et al, 2006].

E-learning Platforms and the Needs of Visually Impaired Students: Some Examples. E-learning platforms often pose a number of different problems to visually impaired students: small characters, crowded pages, pop up windows, iconic menus, complex forms to be filled in, etc…The availability of appropriate customizing options could help to avoid such problems. This platform cannot be used by blind users because it is fully based on visual presentation and no screen reading facility is available. Such a platform, on the contrary, presents a number of facilities allowing personalization and this may help other categories of visually impaired students.

**Conclusion**

This study is more related to identifying the perceptions in implementing ICT tools in teaching and learning in the classroom among school teachers. Furthermore, it examines the challenges of using ICT tools in teaching and learning in the classroom among school teachers and recognizes the effectiveness of the extent of ICT tools in supporting classroom teaching and learning. Based on the study the findings indicate that average level of the perceptions in implementing ICT tools in teaching and learning in the classroom among school teachers, high level of challenges of using ICT tools in teaching and learning in the classroom among school teachers and recognizing the effectiveness of the extent of ICT tools in supporting teaching and learning in the classroom.

Despite the current efforts in ICT integration in schools, many families specifically in rural areas still do not know how to use ICT tools in their daily life. They even did not know how to check their children’s results in the existing systems. Not all houses have computers and Internet facilities to use daily. In this regard, the main challenge is to provide appropriate ICT tools to both urban and rural areas efficiently This study will offer priceless information to the school administration as well as to educational policy makers regarding the nature of ICT contribution to the teaching‐learning process.

In future studies more focus should be given on management strategies and policies to address the barriers faced by teachers in using ICT tools in teaching and learning. If the barriers faced by teachers can be overcome, it is a step forward to enhance our students’ learning outcome. The studies done with the same gender distribution could give more appropriate analysis whereby the gender perceptions could be analysed.

**REFERENCES**

1.Al‐Alwani, A. (2005). Barriers to Integrating Information Technology in Saudi Arabia Education. Doctoral dissertation, the University of Kansas, Kansas.

2. Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. Computers & Education, 47, 373‐398.

3. Alhamd, Alotaibi, Motwaly, & Zyadah (2004). Education in Saudi Arabia. Riyadh, Saudi Arabia: Alroshed press.

4. Almohaissin, I. (2006). Introducing computers into Saudi Arabia secondary school science teaching: Some problems and possible solutions. Unpublished paper.

5. Al‐Oteawi, S. M. (2002). The perceptions of administrators and teachers in utilizing information technology in instruction, administrative work, technology planning and staff development in Saudi Arabia. Doctoral dissertation, Ohio University, Ohio.

6.Balanskat, A., Blamire, R., & Kefala, S. (2006). A review of studies of ICT impact on schoolsin Europe: European Schoolnet.

7.Becta (2004), What the research says about using ICT in Geography. Coventry: Becta

8. Beggs, T. A. (2000). Influences and barriers to the adoption of instructional technology. Paper presented at the Proceedings of the Mid‐South Instructional Technology Conference, Murfreesboro, TN.

9.Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. Eurasia Journal of Mathematics, Science and Technology Education, 5 (3), 235‐ 245.

10.Bransford, J., Brown, A. L., & Cocking, R. R. (Eds.). (2000). How people learn: brain, mind, experience, and school (2nd ed.). Washington, D.C.: National Academy Press.

11.Cachia, R., & Ferrari, A. (2010). Creativity in schools: A survey of teachers in Europe.    Luxembourg: Publications Office of the European Union.

12.Charalambos V., Irineos P., Petros P., Antonaki M., Aravi C., Lucy Avraamidou, Theodoridou K. (2010). Teacher Use of ICT: Challenges and Opportunities, Proceedings of the 7th International Conference on Networked Learning. Retrieved from http://www.lancaster.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/PDFs/Vrasidas.pdf

Cox, M.J., Preston, C., & Cox, K. (1999) What Motivates Teachers to use ICT?. Paper presented at the British Educational Research Association Conference. Brighton. September

13.Cox, M., Preston, C., & Cox, K. (1999a). What factors support or prevent teachers from using ICT in their classrooms? Paper presented at the British Educational Research Association Annual Conference. Retrieved from: http://leeds.ac.uk/educol/documents/00001304.htm

14.Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models.    Management Science, 35(8), 982‐1003. http://www.vvenkatesh.com/it/organizations/Theoretical\_Models.asp#Con=structdefs

15.Dawes, L. (2001). What stops teachers using new technology? In M. Leask (Ed.), Issues in Teaching using ICT(pp. 61‐79). London: Routledge.

16. Empirica (2006). Benchmarking access and use of ICT in European schools 2006: Final report from Head Teacher and Classroom Teacher Surveys in 27 European countries.Germany: European Commission.

17.Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration. Educational Technology, Research and Development, 53(4) 25‐40.

18. Fuglestad A. (2011). Challenges teachers face with integrating ICT with an inquiry approach in Mathematics, Retrieved from http://www.cerme7.univ.rzeszow.pl/WG/15a/CERME7‐WG15A‐Paper02\_Fuglestad.pdf

19.Ghavifekr, S. (2012). The Smart School Policy cycle: A qualitative analysis. Saarbrucken, Germany: LAP LAMBERT, International Academic Publishing.

20.Ghavifekr, S., & Mohammed Sani, I. (2015). Effectiveness of ICT Integration in Malaysian Schools: A Quantitative Analysis. International Research Journal for Quality in Education, 2(8), 1‐12

21.Ghavifekr, S., & Wan Athirah, W. R. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. International Journal of Research in Education and Science, 1(2), 175‐191