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Aliya Mustafina

Nazarbayev University, Kazakhstan,
aliya.mustafina@nu.edu.kz

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Teachers' Attitudes toward Technology Integration in a Kazakhstani Secondary School

Aliya Mustafina*

Nazarbayev University, Kazakhstan

Abstract

The government of the Republic of Kazakhstan from 1997 started operating a systematic state policy for education. Many scholarly papers show that the success of the educational reform efforts depend not only on the ability of the government to supply all schools with ICT, but also on the ability to make teachers possess positive attitudes toward ICT integration. This study contributes to the existing knowledge by providing a current picture of the process of ICT integration in a Kazakhstani secondary school through the lens of the main facilitators of this process – teachers. This mixed-method study fills the research gap by exploring the role of teachers' attitudes toward technology integration in school through examining the factors (self-confidence, knowledge, gender and age) that influence teachers' ICT attitudes and analyzing the subsequent relationship between teachers' attitudes and their students' academic motivation. Findings show that teachers possess positive attitudes toward ICT in school mostly due to the advantages that technology offers such as distant learning and visualization of the material (3D programs). Moreover, the analysis shows that all four factors – confidence, knowledge, gender and age – have the potential to influence and change teachers' attitudes toward technology. Interestingly, age and gender do not seem to have a direct influence on attitudes, confidence or knowledge. Rather, it is the bias towards age and gender that obstructs the integration of technology in school. In addition, the statistical analysis demonstrates that teachers' attitudes toward ICT influence students' academic motivation.

Key words: ICT, technology integration, teachers' attitudes, students' academic motivation, influential factors

Introduction

According to recent research findings, with the introduction of ICT in education numerous changes happened in schools (Howard, 2009). Kazakhstani schools were not an exception to the rule. From 1997 the government of the Republic of Kazakhstan started operating a systematic state policy for ICT in education in the country (The Ministry of Education and Science, 1997). At the governmental level, Kazakhstan identified the availability of ICT and ICT literacy as essential priorities for entering into the international educational arena according to the State Program of Education Development for 2011-2020 years (The Ministry of Education and Science, 2010). At the local level, ICT and ICT literacy were included as obligatory standards and were written into the state curriculum program of education (National Center of Informatization, 2010). At the school level, ICT and ICT literacy became a part of the schools' strategy plans in which it was expected that students would be taught by competent teachers about how to use ICT appropriately and how to integrate it into the teaching-learning process (Damitov et al, 2009).

Almost two decades have passed since the introduction of ICT into the classrooms, and Kazakhstan has made impressive progress within a short time. The country has covered the whole secondary school level with informational technologies (ICT) (Damitov et al, 2009). According to the national report statistics, 98% of urban and 97% of rural schools were equipped with computers and the Internet in 2009 (Damitov et al, 2009). In spite of the huge government investment in the provision of ICT to schools, the results of research conducted by national experts revealed that ICT integration has not reached a desired level (Khalikova, 2013; Kerimbayev et al, 2014; Kaskatayeva, 2014), and the process of technology integration in Kazakhstan has been going more slowly than was expected (Sapargaliyev, 2012). This means that further research is needed in order to shed light on the reasons for the stagnation of technology integration process in Kazakhstan.

Statement of the Problem

* Corresponding Author: *Aliya Mustafina*, aliya.mustafina@nu.edu.kz

The question “What may obstruct the integration of technology in schools?” provoked heated debates among scholars (Howard, 2009). Previously, it was stated that teachers, as those who were supposed to facilitate technology integration in the classrooms, did not do so because of insufficient or inappropriate training or due to limited access to this technology (Clarke & Robinson, 2005; Cohen, 1993). While this is still applies to many schools, research also shows that even if schools are fully equipped with these ICTs and appropriate training is provided to assist teachers on how to implement and use this technology in daily practices, they still do not, in any sufficient numbers, integrate ICTs into their teaching (Ertmer, 2005; Mueller et al, 2008).

It is generally believed that a teacher who possesses positive attitudes toward ICT is more motivated to integrate it into his or her teaching practices (Albirini, 2006; Al-Zaidiyeen et al, 2010; Cavas et al, 2009). Some researchers explain that these attitudes toward technology can vary from very positive to very negative depending on the combination of different factors that may influence these attitudes (Mumtaz, 2000). While many scholarly papers tried to clearly identify these influential variables, there is still a lack of consensus about the universal factors that affect teachers’ attitudes toward ICT. Self-confidence, ICT knowledge, gender and age are among the factors that the author of this article considered to be important as they have been frequently tested in research and discussed in international scholarly papers (see Figure 1). Even taking into account that all four factors are significant, there is still no clear understanding of how and why these factors may affect teachers’ attitudes toward technology integration in school.

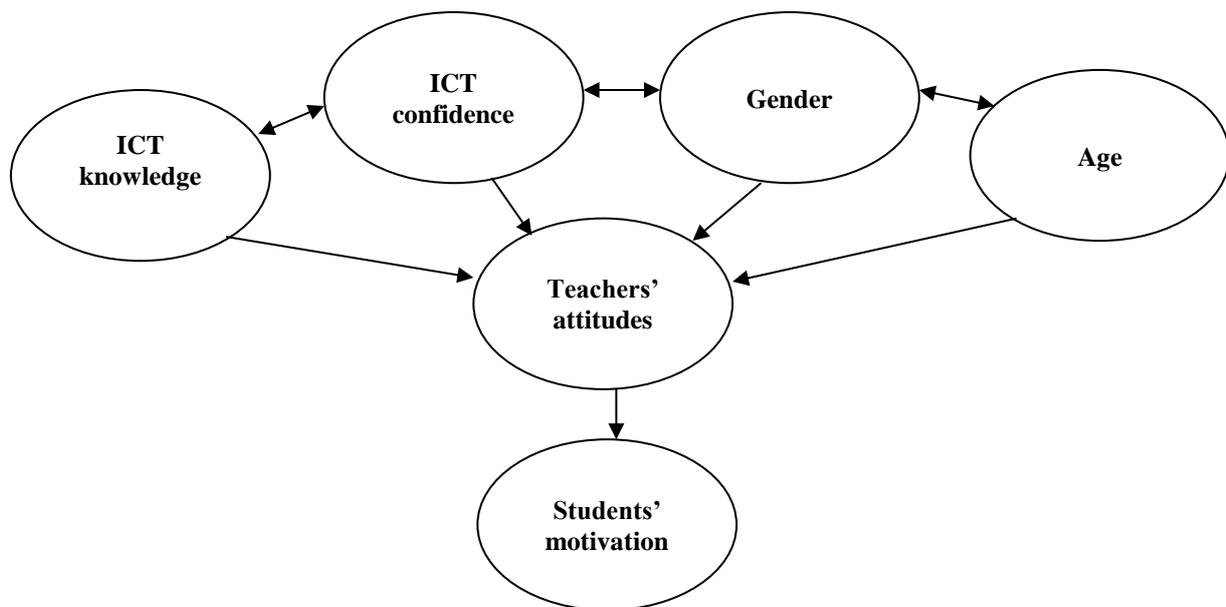


Figure 1. Factors that influence teachers’ attitudes toward technology integration

It is also important to point out that even if the researcher considered that teachers’ attitudes toward ICT influence technology integration in school, the possible impact of these attitudes on students’ academic motivation is in question. Research has shown that ICT may enhance creative and critical thinking skills of learners, and what is more important can be used to support communication and knowledge building among them (Loveless, 2007). However, the researchers have not yet answered the question of how teachers’ attitudes toward ICT, rather than ICT itself, may influence students’ academic motivation. While the results of international research about the impact of ICT on students’ academic motivation are mostly positive, these results may not apply to Kazakhstan.

Purpose of the Study

The purpose of the study is to explore teachers’ attitudes toward technology integration in school through examining the four specific factors of self-confidence, knowledge, gender and age that may influence teachers’ attitudes toward ICT, and analyze the relationship between teachers’ attitudes and their students’ academic motivation.

Research Questions

In relation to the research purpose, three research questions were addressed:

1. What are teachers' attitudes toward ICT integration in school?
2. Do such factors as self-confidence, ICT knowledge, age and gender influence teachers' attitudes?
3. What is the relationship between teachers' attitudes toward ICT and their students' academic motivation toward school subjects?

Definition of Terms

This research explores the role of teachers' attitudes toward technology integration in a Kazakhstani school. Technology in this case is defined as info-communicational technology (ICT) used in teachers' everyday teaching practices. The working definition of ICT for this study is technological devices created for the communication of information through wire-lines and wireless signals which allow users to search, access, store, transmit, and manipulate this information for facilitating or assisting the learning process (UNESCO, 2002). Examples of typical ICT items can be: a computer, the Internet, an interactive board, and a mobile or cell phone (Huggins & Izushi, 2002).

Method

Research Design

This study used a combination of two methods (quantitative and qualitative) which is called the mixed method design. According to Creswell (2013), mixed method aims to provide a better understanding of the research problem and questions rather than either method used by itself. The study consisted of two stages (see Figure 2): collecting quantitative data first, and then collecting qualitative data to help explain or elaborate on the quantitative results. Taking into account the sequence of parts, the explanatory sequential design was applied. The researcher targeted to conduct the study only in one particular school in Astana (Kazakhstan), which meant that it was an in-depth exploration of a bounded system in terms of place (Stake, 1995); this study is an instrumental case study (Creswell, 2014), which served the purpose of illuminating a particular issue – in the case of this study “technology integration in school”.

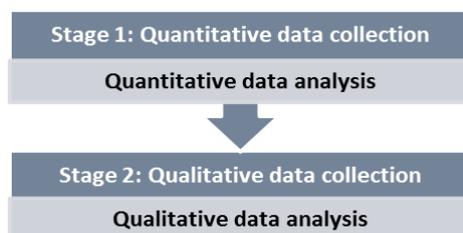


Figure 2. The Explanatory sequential mixed method design

Sampling of Quantitative Part

During the first stage of the study, convenience non-probability sampling among secondary school teachers and their students was used for selecting the participants. It means that all the individuals who were willing and available to participate could be studied (Creswell, 2009). This sampling resulted in 29 teachers and 39 students. In this way any bias in the population was equally distributed among the participants (Creswell, 2014). The sample size was identified with the help of Sample Size formula (2014), according to which 38 participants was enough to have confidence that the survey results were representative owing to the fact that the Margin of Error was less than 20% (see Formula 1 and 2).

Formula 1.

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Formula 2.

$$ss = \frac{(1.96)^2 * (1 - .5)}{(.05)^2} = 38$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)

c = confidence interval, expressed as decimal (e.g., .05 = ±5)

However, taking into account that the researcher conducted a case study, the sample needed corrections for the finite population (see Formula 3, 4 and 5) (Sample size formula, 2014).

Formula 3.

$$\text{new ss} = \frac{\text{ss}}{1 + \frac{\text{ss}-1}{\text{pop}}}$$

Where: pop = population
(the total number of teachers = 93;
the total number of students = 1323)

Formula 4.

$$\frac{38}{1 + \frac{38-1}{93}} = 27 \text{ (teachers)}$$

Formula 5.

$$\frac{38}{1 + \frac{38-1}{1323}} = 36 \text{ (students)}$$

Sampling of Qualitative Part

During the second (qualitative) stage the researcher first used homogeneous purposeful sampling strategy to locate the potential participants, and then used maximum variation sample strategy to choose participants for in-depth interviews and a focus group (Creswell, 2009). All of the participants should have been members of the school community who actively participated the technology integration process. Using a combination of these sampling methods among 29 school teachers and 39 students, the researcher selected 5 school teachers of different subjects with diverse backgrounds in using ICT in order to listen to different opinions about technology integration in the school, and 4 students in order to understand the relationship between teachers' attitudes and students' academic motivation.

Instruments

Initially, there were three research instruments. However, due to an unpredictable resistance of parents, who did not allow their children take part in one-on-one interviews, the researcher had to change the instrument to a focus group interview. Parents explained their fear of one-on-one interviews saying that they did not know what to expect from their child's answers. In order to protect their children, parents refused to sign consent forms. In order to solve the problem, the researcher had to find the solution to it eliminating one-on-one interview at all. Therefore, a focus group interview was suggested to parents as an alternative. In these cases they could be sure that the researcher would not identify what exactly was said by each child because several students would be talking simultaneously, which made the distinction of their voices very hard. Only in this way the researcher was able to include students because their participation was essential for the study.

As a result, four research instruments were used in the study to help address research questions:

1. Survey: "Teachers' attitudes toward ICT";
2. Survey: "Academic motivation of students";
3. One-on-one interview with teachers;
4. Focus group interview with students.

When all the instruments for the research were finished, they were translated into Kazakh and Russian. The "back-translation" procedure (Brislin, 1970) was applied: the instrument was first translated from English into Kazakh and Russian. Then, a different translator translated this version back into English. And after, an English speaker compared the original and the translated versions (Behling & Law, 2000) in order to be sure that during the translation process the initial meanings did not change.

Data Analysis

The data for this study fell into two categories:

- the questionnaire data were analyzed via the SPSS statistical tests;

- the interview and focus group data were analyzed via a method that revealed common and/or important themes.

Results and Discussion

In order to answer the first research question (*What are teachers' attitudes toward ICT integration in school?*), the researcher ran a frequency distribution analysis. The teachers' attitudes toward ICT survey included a series of statements where respondents indicated the extent to which they agreed or disagreed with the statement using a five-point scale (1-strongly agree, 2-agree, 3-neither agree nor disagree, 4-disagree, 5-strongly disagree). The lower the number, the more positive a teacher was toward ICT; the higher the score, the more negative a teacher was toward ICT. The lowest number was 12 (very positive), the highest was 60 (very negative). The majority of the participants scored less than the average (=30), which represented that most of the respondents were more closely aligned with the group of teachers who possessed more positive attitudes toward technology integration in school. The mean was 24.03 (out of 60 possible) and standard deviation is 6.450 which meant that the frequency area was between 17.58 (very positive) and 30.48 scores (positive) (see Table 1).

Table 1. Frequency distribution - teachers' attitudes

Statistics	
Mean	24.03
Std. Deviation	6.450
TOTAL	29

The results of qualitative data suggested that most teachers possess positive attitudes toward ICT, which could be interpreted as an encouraging example that the informatization of secondary education in the country has all chances to be successfully implemented because the main facilitators of this process see the necessity to promote and integrate ICT in education. Teachers' positive attitudes, as presented in qualitative data and discussed in the literature, were mostly caused by the facts that ICT might save teachers' time (as also discussed by Selwood & Pilkington, 2005), facilitate inclusion in education (as also discussed by Florian & Hegarty, 2004), and offer such advantages as an opportunity to study distantly, to visualize material, etc. (as also discussed by Wang, 2005). The reason for teachers' negative attitudes explained by Al-Otewi (2002) and Albirini (2006) was technical problems that teachers faced during the lessons. The Kazakhstani teachers in one of the secondary schools in Astana also pointed out technical problems as one of the main factors, which caused their negative attitudes toward ICT.

The next step was to find the answer to the second research question (*Do such factors as self-confidence, ICT knowledge, age and gender influence the teachers' attitudes?*). The researcher's null hypothesis (H_0) was: factors such as self-confidence, knowledge, gender and age of teachers do not affect their attitudes toward technology integration in school, and alternative hypothesis (H_1) stated the opposite: self-confidence, knowledge, gender and age of teachers do affect their attitudes toward technology integration in school.

Knowledge

An independent-samples t-test also was conducted to compare teachers' attitudes toward technology integration scores for those whose ICT knowledge was limited by observation only and those who were experienced with Microsoft Office (possess basic ICT knowledge). 10.3% of teachers were little more than observers, while the majority of teachers (75.9%) were able to work with Microsoft Office.

Table 2. Teachers' attitudes and knowledge

Variables		N	Mean	Std. Deviation
Teachers' attitudes	Observation only	3	33.67	10.693
	Microsoft Office	22	23.41	5.058

Statistically, there was a significant difference in the scores for observers ($M = 33.67$, $SD = 10.693$) and knowledgeable (Microsoft Office) teachers ($M = 23.41$, $SD = 5.058$) (see Table 2); ($t(23) = 2.888$, $p = .008$, $d = .651$) (see Table 4). These results suggested ($p < .05$) that ICT knowledge of teachers had a moderate effect ($0.51 < d < 1.00$) on their attitudes toward technology integration in school. This study replicated the results of previous studies. More than 20 years ago, the same moderate relationship between teachers' attitudes and ICT knowledge was found out by Woodrow (1994), however, the p-value was not significant in his case, while the results of this particular study suggested that the results could be generalized to the whole population (in this case, the teachers in the same school) because p was significant (see Table 3).

Table 3. Independent samples test – teachers' attitudes and knowledge

Variables	Sig.	t	df	Sig. (2-tailed)
Teachers' attitudes	.028	2.888	23	.008

According to the qualitative data analysis, most of the teachers were knowledgeable enough to conduct the lessons appropriately using ICT in the classrooms, and students noticed positive changes in teachers' practices.

Self-Confidence

The relationship between self-confidence (independent variable) and teachers' attitudes toward technology integration in school (dependent variable) was investigated with the help of a one-way between-groups ANOVA analysis. It compared the effect of self-confidence on teachers' attitudes toward technology integration for confident, average and non-confident teachers. There was a significant effect of confidence on teachers' attitudes toward technology integration at the $p < .05$ level for the 3 groups [$F(3, 29) = 5.081$, $p = .007$] (see Table 4).

Table 4. Teachers' attitudes and confidence

Variables	df	F	Sig.
Teachers' attitudes and confidence	3	5.081	.007
TOTAL	29		

Post hoc comparisons using the Scheffe test indicated that the mean score obtained by confident teachers ($M = 7.733$) was not different from the mean score obtained by non-confident teachers ($M = 7.733$) (see Table 5). Taken together, these results suggested that self-confidence affected teachers' attitudes toward technology integration in school. Therefore, the researcher could reject H_0 . The results suggested that they could be generalized to the whole population (because p was significant) (see Table 5).

Table 5. Multiple comparisons – teachers' attitudes and confidence

Variables		Mean Difference	Sig.
Teachers' attitudes	Confident	-7.733*	.037
	Average confident	7.983	.100
	Non-confident	7.733	.188

The statistics showed that self-confidence and teachers' attitudes were positively correlated. In addition, the analysis showed that the situation in one of Kazakhstani secondary schools was very similar to the international common tendency according to which, the majority of teachers referred themselves to average confident ICT users (Jamieson-Proctor et al, 2006; Mumtaz, 2000; Watson, 2001).

Gender

Initially, an independent-samples t-test was conducted to compare teachers' attitudes toward technology integration scores for male and female groups. The survey was answered by 29 teachers: 1 male and 28 females (see Table 6). Due to the fact that there was only one male teacher among the whole sample, the SPSS analysis was impossible to conduct.

Table 6. Demographic information - gender

Variables		N	X
Gender	F	28	96.6
	M	1	3.4
TOTAL		29	100

Statistically, gender was one of the limitations of this study, the relationships between gender and teachers' attitudes toward ICT were not statistically proven. The fact that gender might affect teachers' attitudes toward ICT was firstly rejected in Chen's (1986) study, where he found no correlation between gender and teachers' attitudes (as cited in Broos, 2005). Even taking into account the fact that the researcher was not able to prove the direct relationship between gender and teachers' attitudes, the analysis of the interviews suggested that there was an indirect correlation between these variables. The analysis showed that gender of the teacher might influence his or her confidence, which in turn, might affect the knowledge level the teacher had in using ICT. However, it is reasonable to mention that in an everyday reality the teaching profession in Kazakhstan is female-dominated (96.6%).

Age

A one-way between-groups ANOVA, was conducted to compare the effect of age on teachers' attitudes toward technology integration for the age groups of 22-30, 31-40, 41-50 and 51 or more. There was no significant effect at the $p < .05$ level for 4 groups [$F(3, 29) = .337, p = .799$] (see Table 7). Therefore, the researcher could not reject H_0 and results could not be generalized to the whole population.

Table 7. Teachers' attitudes and age

Variables	df	F	Sig.
Teachers' attitudes and age	3	.337	.799
TOTAL	29		

The relationship between teachers' attitudes and the influential variable - age, was not determined. However, the qualitative data revealed that these variables had a non-direct influence on teachers' attitudes through teachers' confidence and knowledge (see Figure 3), as it was predicted by Durndell and Haag (2002).

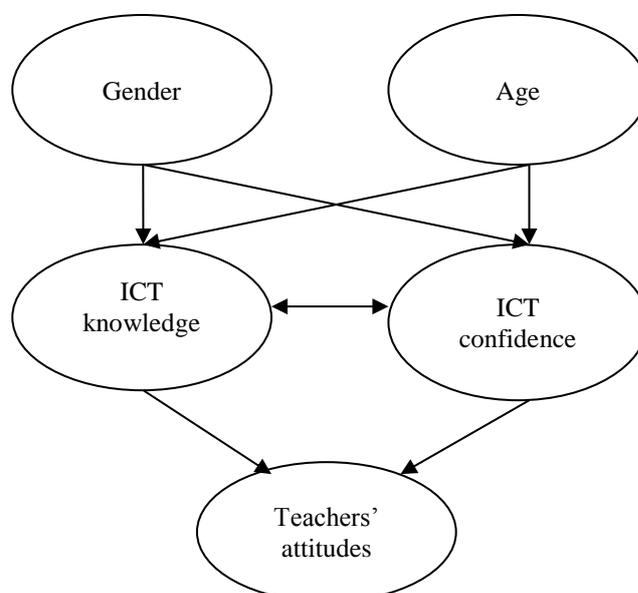


Figure 3. The relationships between the influential variables and teachers' attitudes

Academic Motivation of Students’ and Teachers’ Attitudes toward ICT

Lastly, it might be stressed that scholars’ (Watson, 1993; Bliss, 1994; Liao, 1999; Cox & Abbott, 2004) hypothesis that teachers’ attitudes might influence their students’ academic motivation was proven in this study. A frequency distribution analysis was run in order to get general information whether teachers’ attitudes toward ICT influence their students’ academic motivation toward school subjects or not. The questionnaire was answered by 39 students (19 males and 20 females) (see Table 8).

Table 8. Frequency distribution - demographic information (students)

Variables		N	X
Gender	F	20	51.3
	M	19	48.7
TOTAL		39	100

The lower the number, the more students agreed that teachers’ attitudes toward technology influence their academic motivation toward subject; and vice versa, the higher the score, the more students rejected the fact that teachers’ attitudes toward technology had an effect on their academic motivation toward school subjects. The lowest number was 10 (affect), the highest was 50 (do not affect). Almost half of the participants scored less than average (=25) which represented that most of the respondents agreed that teachers’ attitudes toward ICT had a positive impact on their academic motivation toward school subjects. The mean was 24.36 (out of 50 possible) and standard deviation was 4.992 which meant that the frequency area was between 19.368 (motivated) and 29.352 (neither motivated nor unmotivated) scores (see Table 9).

Table 9. Teachers’ attitudes and students’ motivation

Statistics	
Mean	24.36
Std. Deviation	4.992
TOTAL	39

Moreover, it is important to mention that interviewed teachers truly believed that ICT facilitated the study, positively affecting their students’ academic motivation. Their belief was supported by the statistics and students’ interview responses. However, the researcher’s analysis suggested that there was a discrepancy between teachers’ interpretation and students’ understanding of teachers’ positive attitudes toward technology integration in school. Most of the teachers believed that if they allowed or pushed students to use the technology, this meant that the teacher proved that he or she possessed positive attitudes toward technology integration in school. However, allowing students to embrace technology is not the same as facilitating the integration of technology. Such misunderstanding can also become a preventing factor that deters ICT successful integration in school. This fact may also explain why it was hard for students to provide any example when teachers’ attitudes toward technology positively affected their (students’) academic motivation because students’ understanding and their teachers’ interpretation were two opposite things (see Figure 4).

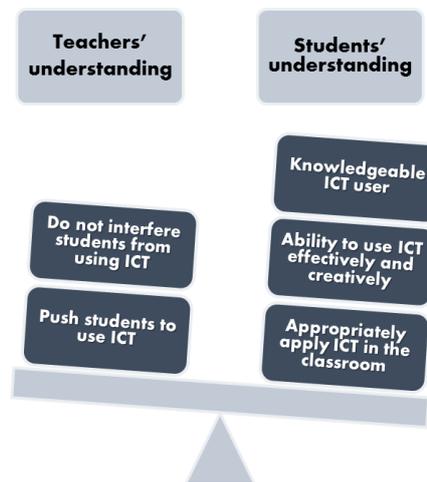


Figure 4. Teachers' interpretation and students' understanding of positive attitudes

Conclusion

The following discussion summarizes the results of this study in relation to three main research questions:

Teachers' Attitudes toward ICT Integration in School

The findings showed that mostly teachers were very positive toward technology integration in school. Every single interviewed teacher could see the reasons and a necessity to implement ICT in their practice. However, the success of this implementation was still under the question because according to the students' responses, the use of this technology during the lessons was a rare thing. Even though, the technology integration in school still has all chances to succeed.

Influence of Self-confidence, ICT Knowledge, Age and Gender on Teachers' Attitudes

The surprising fact was that the level of confidence and knowledge that the teachers possessed played a significant role in their attitudes toward technology. These aspects predetermined the teachers' acceptance of this technology and their "likelihood" to use ICT in pedagogical/teaching practices. Moreover, the finding demonstrated that the factors that were supposed to have a direct effect on teachers' attitudes toward technology in school, such as gender and age, had an indirect impact affecting teachers' level of confidence and knowledge, and through these factors had a potential to influence teachers' attitudes toward ICT. In this way, it could be concluded that the human nature (such as gender and age), had leverages to change or to construct the non-heritably acquired characteristics of a person (such as confidence and knowledge), which had a possibility to change the attitudes and beliefs of that person. That is why, it was considered that the neglecting of natural factors might be drawn forth for understanding the real picture.

Relationship between Teachers' Attitudes toward ICT and Their Students' Academic Motivation toward School Subjects

As for the relationship between teachers' attitudes and students' academic motivation, the analysis showed that there was an interconnection: the more positive teachers' attitudes toward technology were, the more motivated students toward their subjects were. However, the interview data suggested that the level of students' motivation was higher in comparison with the level of teachers' usage of this ICT in the classroom. Students did not get satisfaction from the studying process due to teacher's inability to use this technology effectively and creatively. Even taking into account that ICT was used not at a desired level, the students' stressed helpfulness of technology in knowledge acquisition process. Even if the teacher did not appropriately apply ICT in the classroom, the students themselves knew how to do it. They were very supportive and assistive in helping those teachers who needed their help or asked for it because students were interested in gaining up-to-date/cutting edge knowledge.

Recommendations

This research was oriented only on one particular secondary school in Astana, Kazakhstan, which could be considered as a limitation due to the fact that the conclusions drawn from this particular case, although reflects the reality of this school, may not be extrapolated to the general population. The results were not generalizable because the researcher could never know whether the case was representative of the wider body of "similar" instances or not (Creswell, 2014). Taking into account that the analysis of qualitative data fully depended on the researcher's own interpretation, there was always a possibility of being biased or subjective which could have intruded the assessment of what the data really meant (Creswell, 2009). The shortage of male participants in this study resulted all interviewees to be females, and which in turn caused the infeasibility of analytical calculations in SPSS program. In further research, it would be useful to choose stratified probability sampling in order to have an opportunity to control the proportion of male and female participants. This research was based on survey and interview instruments. The next studies can improve the study by building a classroom observation. In addition, a longitudinal study will be recommended which might be helpful to trace changes in teachers' attitudes with and without technology.

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