Teaching with technology at Russian universities: self-confidence and use

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Abstract

This study explore the use of learning activities with technologies by teachers at Russia universities (n=103). The Inventory of Learning Activities with Technologies in the University (IAATU) was translated and adapted to Russian context and validated by retest method (n=40). Answers were classified through content analysis. Findings suggest that access to technology, on-line courses and data elaboration software among teachers should enhanced. Teachers' self-confidence and use of technologies are related: one increases the level of another and vice-versa.
Keywords: learning activity; self-confidence; technologies; teachers; university

1. Introduction

Since supercomputing is considered a strategic area [1], the relevance of supercomputing education is increasing [2] [3]. The effort taken by Russia is justified [4] [5]. Nevertheless, despite its success, it is considered that improvement could be developed [6].

An analysis of the state of things of 2010 [4] showed that supercomputing education is narrowed to studying only several simple technological subjects at the University. Due to that, an appropriate education of users in supercomputer centers is critically low [3]. A recent analysis of the current state of the High Performance Computing (HPC) and Computational Science research [7], briefly highlighted the necessary scalability at all levels and highly trained computational scientists with the ability and skills to approach complex scientific problems.

The skills necessity claims of specialists in supercomputing [7] [8]; is not new. The workforce and the technology disparity has been researched for a long time [9]. Proposals to bridge the skills gap have covered, for example, the HPC competency as a requirement in the research and engineering curricula [1], following this approximation, the unification of skills at university level and advanced research methodology has been proposed [10]; [7], curriculum contents and knowledge assessment integration [11]. Other studies have been focused on the diffusion of supercomputing education to improve the use of supercomputer systems and the change of the higher educational system [3].

Proposals and research have tended to focus on the skills and knowledge required in a wide range of computer science issues of a specialist nature in the area of supercomputing technologies [7], rather than attitudes. As evidence of the importance of attitudes, the recent analyses about training students in clusters competition, found that attitude is one of the missing elements [8]. In conclusion, due to the Thai personality characteristics, only interested students counted.

Therefore, studies on the learners and the teachers could help to determine if they are ready for a new technology [12] . Student-centered approaches to learning have encouraged teachers to integrate technologies into their teaching. Empirical research reported that teacher attitudes and personal use of technology, accounted for 55% of the variance [13]. Considering teachers as facilitators, the incorporation of technology into their teaching is critical [14] . In fact, it is necessary to understand how the implementation of a technology could improve the perceived competence and use of teachers in their teaching [15] .

From a technology-enhanced learning perspective, understand the reasons of teachers using or not technology and what they should know in order to use it, requires further research [16; 17]. In this context, teachers requirement of more preparation is a relevant issue in Russia [18]. Moreover, what technologies do Russian teachers use related to learning activities is missing.

The "Inventory of Learning Activities with Technologies in the University" (IAATU) [19] is useful to analyze how different digital technologies are integrated into the classrooms of the Russian universities and can also be used as an instrument to assess what type of learning activities using technology do university teachers design in Russia. Recent research in relation to determine the possibilities of using technology in high education highlighted the increase of favorable circumstances for a professional competency development [20].

The problem of training specialists in the field of supercomputing has been widely discussed. But no from this perspective. This study is a contribution to new knowledge in the field, from the approach of teacher attitudes, specifically confidence, with the use of technology in the design of learning activities.

2. The object of the study

The main purpose of this study is to investigate teachers' confidence using technology in their learning activities at the Russian Universities.

2.1. Population

103 answers were collected from the online survey, since February to April, 2016. 52.4 % females and, 47.6 % males. 43.7%, in the age group of 31-40, 17.5 under 31 and 9.7% over 61. 44.7% of the teachers from Russia Universities. Re-test

(n=48) was realized at Samara University. 47,9% women and 52,1% men. In relation to age 16,7% between 20 and 30 years old, 27,1% (31-40), 27,1% (41-50), 12,5% (51-60) and 16,7% (61-70).

2.2. Instruments

In order to explore to what extent university professors are using technology as a pedagogical support resource, IAATU was used. The adapted Russian version of IAATU, with 38 items distributed among 1 to 6 on a double Likert-type scale, collect demographic information such as: gender, age, university, field of knowledge and professional category. One scale refers to frecuence use level while the other refers to the degree to which the teacher feels confident using the technology. Two open questions in relation to technology not included and the use of technology at the University, are included.

2.3. Data analysis

Descriptive statistical methods were employed to analyze the level of the participants in self-confidence and in the use of technology. IBM SPSS Statistics and univariate were used to describe the characteristics and activities learning technologies frequency of the participants. In addition to pretest the Russian target language version of IAATU, re-test with target language subjects was conducted [21].

Temporal stability of the responses were analyzed on the same group of respondents with an interval of one month by means of a method based on the use of IAATU [22] .Moreover, the correlation coefficient between the two intervals of IAATU were examined [23].

Likewise, considering coefficient alpha and retest as index of reliability, were calculated [23] .The estimated internal consistency of each scale in the retest is provided in order to increase confidence in measure [24].

In order to analyze the content of open questions a frequency criterion was adopted. That is, higher was the number of the repetition of the same or of similar terms in the answers, higher was the importance of such words. In this case, the words of the answers were also to be evaluated as word-concepts to count in order to establish which specific problems of access to technology are present among the teachers of Russian Universities. For example we got a word-concept as <lack of software> from analyzing and summing up an answer like: “I can not use technology in class, because there is no software to be used for economic tasks. Or at least I do not know them.”

3. Results and Discussion

Scales of level of use (Cronbach’s α = .91) and self-confidence (α = .93). Results re-test in relation to use (α = .93) and Self-confidence (α = .94) were reported with a value above Cronbach’s α = .95 scales. It showed very good reliability and internal consistency, which meets the criteria of reliability [25].

3.1. Teachers’ self-confidence levels within the technology domain

As previously reported, association between the use of learning activity and self-confidence in the Russian adaptation of IAATU were established [26].

In relation to the re-test analysis, the average use and confidence score for each of the items (Table 1) were calculated. Three groups of learning activities are identified in relation to the mean: low level (mean 1-2.5), medium (2.5- 3.5) and high (3.5-5). The average confidence is higher than the use. According to the same statistic (Table 2), up to 8 items have a high average use and confidence score (3.5-5). According with previous research, this results suggest that teachers' technology previous practice and confidence could determine their use of technology in their teaching [27] .

Table 1. Average use and confidence score

Ítem	Use		Confidence	
	M	SD	M	SD
Ítem 1	3.90	1.13	4.58	.65
Ítem 3	3.65	1.15	4.38	.85
Ítem 10	4.31	1.05	4.61	.68
Ítem 16	4.17	1.05	4.48	.94
Ítem 19	3.51	1.33	4.21	1.04
Ítem 23	3.70	1.35	4.29	1.01
Ítem 35	4.02	1.29	4.28	1.14
Ítem 37	4.18	1.05	4.27	1.04

In addition for five items, trust is high (3.5-5) and the use is medium (2.5-3.5): Ítem 4 “During my presentations and to facilitate my students’ understanding of given concepts and ideas, I use video segments found on Internet” (*M*=3.11 *SD*=1.18, *M*=4 *SD*=1.04), Ítem 6 “Using the virtual platform, I provide my students with videos, demonstrations, simulations, experiences and/or cases to expand the information they received” (*M*=2.52 *SD*=1.41, *M*=3.56 *SD*=1.48), Ítem 9 “I select text documents and I make them available to my students on the virtual platform in an effort to improve the reading understanding of my subject content” (*M*=3 *SD*=1.53, *M*=3.78 *SD*=1.45), Ítem 13 “I design practical cases, using digital resources (videos, presentations,

specific software, etc.), so that students can apply the theory learned to practical cases" (*M*=3.25 *SD*=1.37, *M*=3.95 *SD*=1.18), Ítem 22 "I design problems in which students have to solve complex problems, using digital resources, similar to those a professional would use" (*M*=3.38 *SD*=1.56, *M*=3.95 *SD*=1.37).

Spearman correlation is significant in all cases except for item 3 (*M*=3.65 *SD*=1.15, *M*=4.38 *SD*=0.85) "During my presentations, I show students some type of simulations, demonstrations or examples based on digital resources, either my own, or available on the web, to clarify concepts and ideas". Unlike the initial results, the strength of the association of the items is not coincident in most cases. It would be necessary further research in order to determine the reasons.

According to the Mann-Whitney U tests only the level of use of item 18 "I design activities in which students must provide comments or given their point of view by means of personal or group blogs" differs according to sex (sig. 0.32). The confidence level of items 17 "I facilitate interaction with students outside the classroom by means of cellphone applications such as WhatsApp, Line, Twitter, Facebook, etc. to motivate the exchange of information, the resolution of doubts…" (sig. 0.15), 18 "I design activities in which students must provide comments or given their point of view by means of personal or group blogs" (sig. 0.15), 29 "I use virtual platform tools so that students can turn in homework/papers for my subject" (sig. 040), 30 "When assessing students, I use electronic portfolios, created on the actual platform or with specific online tools, for continual assessment" (sig. 0.002) differ according to gender. According to Kruskal, the level of use of items 20 "I ask students to write reports, essays, articles, etc. using reference management tools such as Zotero, Refworks, Mendeley, Endnote..." (sig. 0.009) and 38 (sig. 0.039) differed according to age. Only the confidence of 38 "During my teaching activities, I attend the terms of use for the digital materials that have a Creative Commons license" (sig. 0.46) differed according to age.

Table 2. Average use and confidence score

	Ítem 1	**Ítem 2**	**Ítem 3**	**Ítem 4**	**Ítem 5**	**Ítem 6**	**Ítem 7**	**Ítem 8**	**Ítem 9**
Coefficient	,521	,699	,287	,483	,698	,625	,720	,541	,845
Sig. (bil)	,000	,000	,066	,001	,000	,000	,000	,002	,000
	Ítem 10	**Ítem 11**	**Ítem 12**	**Ítem 13**	**Ítem 14**	**Ítem 15**	**Ítem 16**	**Ítem 17**	**Ítem 18**
Coefficient	,675	,822	,766	,731	,719	,929	,667	,890	,791
Sig. (bil)	,000	,000	,000	,000	,000	,000	,000	,000	,000
	Ítem 19	**Ítem 20**	**Ítem 21**	**Ítem 22**	**Ítem 23**	**Ítem 24**	**Ítem 25**	**Ítem 26**	**Ítem 27**
Coefficient	,636	,853	,908	,839	,603	,752	,723	,925	,913
Sig. (bil)	,000	,000	,000	,000	,000	,000	,000	,000	,000
	Ítem 28	**Ítem 29**	**Ítem 30**	**Ítem 31**	**Ítem 32**	**Ítem 33**	**Ítem 34**	**Ítem 35**	**Ítem 36**
Coefficient	,947	,942	,812	,803	,919	,949	,910	,664	,971
Sig. (bil)	,000	,000	,000	,000	,000	,000	,000	,000	,000
	Ítem 37	**Ítem 38**							
Coefficient	,644	,935							
Sig. (bil)	,000	,000							

In order to complete the study content analysis of open questions, (Table 3) and (Table 4), following frequency criteria was applied.

The first open question (Table 3) was: "If your learning process involves technologies that are not listed in the questionnaire, please describe them". It is highlighted that 6 answers specifically mentioned the System Management Learning (LMS) Moodle, as a technology not mentioned in IAATU. Moodle is the main LMS used in Russian universities [28].

Table 3. Technologies not listed in IAATU

Type of technology	Number of answers
Courses	11 / 55
Software	9 / 55
Others	9 / 55
No answers	26 / 55

The second open question (Table 4) refers “If you want to leave a comment on the questionnaire with questions on the educational process with the use of technology at the University”. 13 answers mentioned the University as responsible of the use of technology by teachers. 9 of them referenced the lack of access and availability of technology and 3, training needs.

Table 4. Problems to implement technology

Type of answer	Number of answers
Questionnaire	17[A1] / 47
University	13 / 47
Self-confidence	6 / 47
No answers	16 / 47

[A1] count 2 comments of one person as 2

Analysis showed that the more frequent problems reported by teachers at Russian University are technology acknowledge This allowed us to understand that at the present day Russian Universities suffers of an insufficient usage of technological means and structures. Another problem connected to the access of technology could be explained also with the actual lack of software or knowledge of the newest software adapted to be used for specific task in the didactic by the Engineering and Economy Faculties.

It is plausible that this research may have limitations that could have influenced the results obtained. First, the high value of no answers to the open questions can be interpreted as perceived ambiguities in the meaning due to the fact that back-translation was not applied. Although it is not considered mandatory [29], it provides an assertion that the instrument is the same in two languages [21].

Second, retest assessments could introduce bias, due to the risk that respondents desire to appear consistent [30]. Furthermore, due to the IAATU was translated into a new language, from Spanish to Russian, to avoid the assumption of hypotheses about the dimensionality of a given set of items, exploratory factor analysis (EFA) could be applied [31].

Despite of the limitations, the results of this study coincide with previous research [32], [19]; level of use of learning activity in teachers depend on the self-confidence. Concerning to the use of digital technology, recent empirical studies pointed that patterns of technology use emerge from the frequency of use and by the nature of the activity [33]. Moreover, evidence has showed how teacher confidence in a task can be regulated by self-efficacy [34]. However, as confidence not necessarily specify what the certainty is about [34], further data collection is required in order to determine exactly how confidence affects the use of technology in the design of learning activities at Russian Universities context.

4. Conclusion

This research contribute to new knowledge in the field of competency-based approach that acquires more holistic structure [35]. Relationship between teachers’ own technology practices and the type of technology activities they assign to students has been examined. Previous research has pointed advanced training for specialists and university teachers in various applied areas where supercomputing systems can be used for problem solving [4]. This study suggest that supercomputing education could enrich from an approach that take into account personal beliefs and actions based on attitudes as teachers’ confidence in their own technology use.

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