RESEARCH ARTICLE

Journal of Ecophysiology and Occupational Health, *Vol 24(4), DOI: 10.18311/jeoh/2024/43796, 427-433, December 2024*

ISSN (Online) : 0972-4397
ISSN (Online) : 0974-0805

Digital Competence Among Secondary School Teachers in Relation to Gender, Locale and Type of Institution

Karan Kumar* and Shaveta Sharma

Department of Education, Sant Baba Bhag Singh University, Jalandhar - 144030, Punjab, India; sharman.karan@gmail.com

Abstract

The study examined the digital competence in relation to gender, locale and type of institution of 500 teachers in secondary schools. The data was collected using the Digital Competence Scale by Shipra Shrivastva and Kiran Lata Dangwal. The result of the study showed a significant difference in digital competence of (i) male and female teachers in secondary school with male teachers being more digitally competent; (ii) between urban and rural secondary school teachers with urban teachers having higher digital competence; and (iii) between secondary school teachers from government and private schools with private school teachers having higher digital competence.

Keywords: Digital Competence, Gender, Locale, Secondary School Teachers, Type of Institution

1. Introduction

In today's digital age, education has profoundly evolved, embracing a new era shaped by the widespread impact of digital technologies[1]. From computers to the internet, these tools have changed how we access, share, and learn information, not only in schools and universities but also across various digital platforms, expanding education's horizons beyond traditional boundaries[2].

The digital age presents education with opportunities and challenges, fundamentally altering how we learn and teach. It reshapes our interaction with knowledge, prompting adaptation to new learning paradigms[3]. From teaching methods to student engagement, digital tools are altering various educational aspects, prompting teachers to shift from traditional roles to facilitators of digital learning[4]. As technology evolves and integrates further into our lives, teachers must continually enhance their digital competence, emphasizing the growing importance of digital skills in modern education[5].

Digital literacy is accentuated as an essential life skill for everyone in the twenty-first century. It has been referred to as 'survival skills in the digital era' by Eshet[6] and 'essential assets in the information society' by van Deursen[7]. According to the digital agenda for Europe 2020 as per the European commission[8], digital competence is one of the fundamental skills that every person in a knowledge-based society should possess. It is a complex and dynamic notion that encompasses various sectors and literacies, continuously growing with the emergence of new technologies.

Digital competence is not merely a skill set, it's a profound necessity for educators in our digitally saturated world. It demands not only technical proficiency but also the ability to navigate and critically evaluate information, essential for thriving in a knowledge-driven society[9]. Beyond empowering educators to enrich learning experiences, it enables them to transcend limitations across multiple spheres, fostering collaboration and

**Author for correspondence*

Article Received on: 28.04.2024 Revised on: 12.06.2024 Accepted on: 21.06.2024

communication while unravelling the intricate dynamics of our digital landscape[10].

The "Recommendation on key competencies for lifelong learning," released in 2006 by the European commission[11], outlined the attributes of digital competence, with it being the fourth on the list. The European Commission works on improving digital competence by using Information Society Technology (IST) effectively for things like work, fun, and sharing ideas with others. Fundamental ICT abilities play a pivotal role in this endeavour, enabling individuals to effectively utilize computers for tasks ranging from accessing and assessing information to saving, creating, presenting, and sharing it. Furthermore, these skills facilitate active participation in online collaboration via the internet, serving as a cornerstone for individuals to navigate and excel in the digital age. These concerns resulted in the establishment of work plans to create appropriate frameworks for assessing digital competence and developing ways to assist students in building strong digital skills.

Digital competence according to Calvani *et al.*[12] is defined as 'the capacity to explore and face new technological situations flexibly, to analyze, select and critically evaluate data and information, to exploit technological potentials to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one's responsibilities and the respect of reciprocal rights/obligations.'

Newman[13] opined that 'a digitally competent person has effective ICT skills, an ability to critically evaluate information and social awareness. Such a person can use the most common technologies to safely find and/or publish digital resources, commonly via the internet. They can critically evaluate what they find, remembering that people and knowledge even with good intentions can be fallible. They understand internet 'etiquette', and consider the appropriateness, consequences and longevity of information before broadcasting information online.'

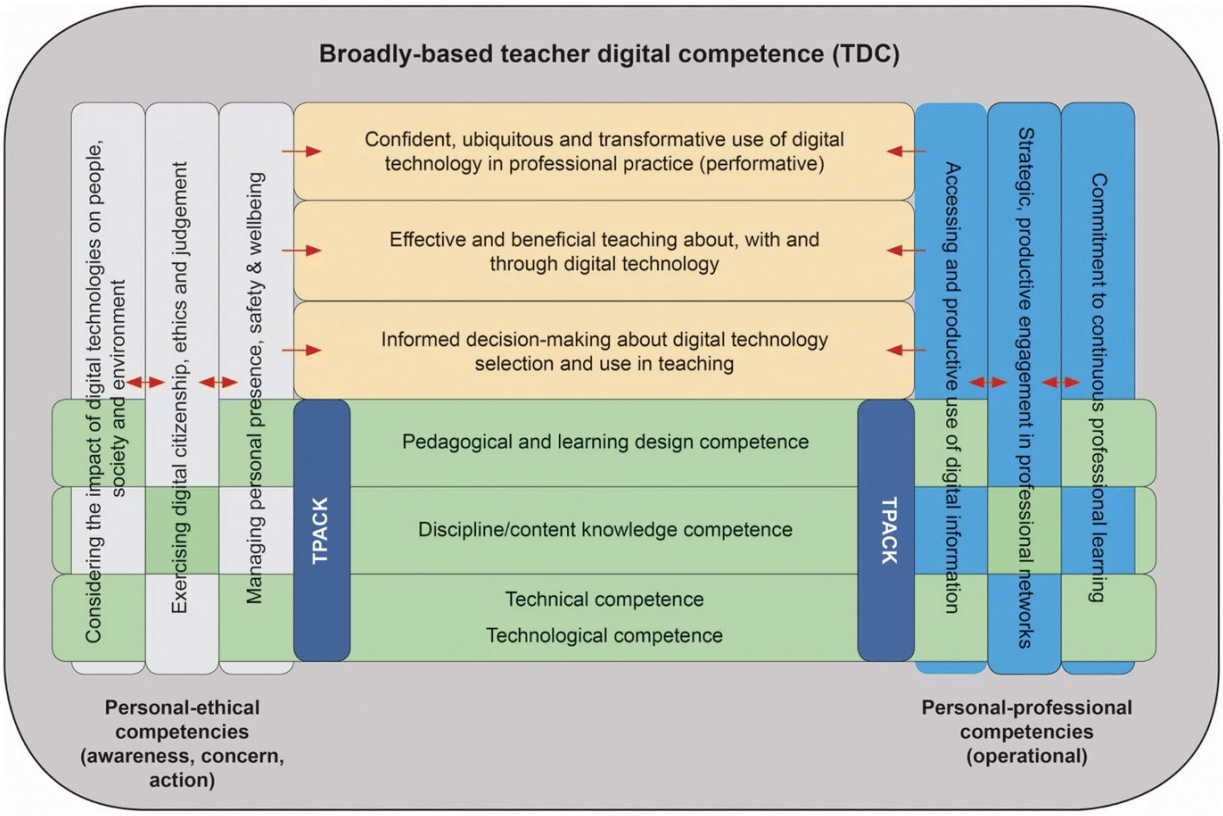
According to Ilomaki *et al.*[14], 'digital competence is generally understood to encompass a wide range of complex skills, including cognitive, motor, sociological, and emotional abilities that users must possess to use digital environments effectively. It goes beyond simply knowing how to use software or operate digital devices.'

After examining various frameworks for the enhancement of digital competence, Ferrari[15] describes DIGCOMP in her findings as 'digital competence is the set of knowledge, skills, attitudes including abilities, strategies, values and awareness, that are required when using ICT and digital media to perform tasks, solve problems, communicate, manage information, collaborate, create and share content, and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socializing, consuming, and empowerment'.

According to Sharma and Sharma[16], digital competence encompasses a wide range of intricate abilities, spanning cognitive, physical, social, and emotional aptitudes, which individuals require to navigate digital settings effectively. A recent survey conducted by Krumsvik *et al.*[17] involved 17,529 secondary school students and 2,524 teachers in Norway. The findings revealed a significant correlation between students' academic performance in various subjects and the digital proficiency of their instructors. This underscores the critical role educators play as digitally literate role models for their students, both in terms of ICT utilization and subject learning. The study emphasizes the importance of integrating competency development in digital skills starting from the education of future teachers, highlighting the need to equip student teachers with the necessary tools to effectively leverage technology in their teaching practices. Digitally proficient teachers positively impact students' subject learning and ICT utilization in schools.

Janssen *et al.*[18] constructed a robust digital competence model comprising 12 interconnected domains, including functional, integrative, communicative, and ethical skills, vital for navigating the digital landscape. These competencies range from practical tool proficiency to ethical considerations, reflecting the multifaceted nature of digital literacy and its impact on various aspects of life and society. This model encourages reflection on how digital skills are applied across different domains, promoting adaptability, ethical conduct, and informed decision-making in an ever-evolving digital world.

The Teacher Digital Competence (TDC) framework expands on Teaching, Practice and Content Knowledge (TPACK)-aligned competencies by emphasizing the expertise required to incorporate digital tools for subject-specific learning. The bars, which are horizontal and green in colour, represent the key TPACK components, and the side pillars, which are vertical and dark blue in colour, show how they come together to create the abilities and expertise required to utilise digital technology



Source: Falloon[19]. From digital literacy to digital competence: The Teacher Digital Competency (TDC) framework.
Figure 1. Illustrates the conceptualization of the Teacher Digital Competence (TDC) framework based on Lund *et al.*

for subject-specific learning. Technical competence is a deep understanding of how to effectively operate a variety of digital technologies, including mobile devices, applications, network services, and more. Technological competency emphasizes comprehending the theory behind digital technologies' function and potential in education, as well as the reasons for incorporating them into educational settings. This framework aligns with the UNESCO framework for teachers' ICT competency, encompassing educational environments and administration, pedagogical strategies, curriculum design and assessment, policy formulation and implementation, knowledge and skill development, as well as professional and personal advancement UNESCO[20].

Though digital competence is essential for all levels of teachers, however, it is more pertinent for secondary school teachers. As students aspire to excel in both their personal and professional pursuits, and to confront the exigencies of an ever-evolving digital landscape, accessing online educational resources, collaborating with peers via digital platforms, and participating in interactive learning experiences that transcend conventional pedagogical approaches become indispensable. Therefore, the acquisition of digital proficiency by the culmination of secondary education is paramount. Such proficiency equips students with the ability to scrutinize information, apply critical thinking skills, and adeptly navigate intricate challenges.

In conclusion, digital competence at the secondary school level is essential for preparing students for the demands of the modern world. It provides them with the expertise they require to succeed academically, professionally, and personally in an ever-evolving digital society. Schools and educators must prioritize the development of digital competence among students to ensure their future success. And this is possible only if we have digitally competent teachers at the secondary school level.

A study was carried out by Alazam *et al.*[21] to assess the ICT skills of teachers in technical and vocational subjects in Malaysia. Data was collected from three hundred twenty-nine teachers in technical and vocational

institutes in Malaysia. The survey revealed that teachers possessed intermediate levels of ICT abilities. It was also found that teacher's demographic characteristics such as age, gender, and teaching experience did not impact the ICT incorporation in educational settings, except for level of education.

Fernandez-Batanero and Colmenero-Ruiz[22] explored teachers' attitudes towards ICT and inclusive education in secondary schools. The findings indicate that teachers, particularly male teachers, exhibit a favourable outlook towards ICT, with increased opportunities for engagement with this technology.

Hinojo-Lucena *et al.*[23] researched 140 permanent education teachers in Andalusia, Spain. The results confirmed that teachers have low digital competence, which is influenced by criteria such as age, kind of educational institution, previous ICT training, academic degree, teaching experience, and professional category.

Moreno Guerrero *et al*[24] investigated the influence of age on digital competence, area of information, and information literacy among students in teacher education programs focusing on compulsory secondary education in Ceuta, Spain. The study employed a quantitative method with a sample size of 153 students. Analysis of the results reveals that age serves as a significant influential factor in digital competence also prospective instructors possess a moderate level of proficiency in information competence, information literacy, and digital material.

Choudhary[25] studied the impact of gender and type of school on the digital competence of teachers in secondary schools. The sample consisted of 200 teachers from government and private secondary schools in Jammu district. Results showed a significant difference in digital competency based on gender and type of school with private secondary school teachers exhibiting higher digital competency than government secondary school teachers. Female secondary school teachers have superior digital competency compared to male secondary school teachers.

The present research paper also aims to explore the digital competence among secondary school teachers about gender (male/female), locale (urban/rural) and type of institution (government/private). The study has been undertaken with the following objectives:

1. To find out the difference in digital competence of male and female secondary school teachers.
2. To examine the difference in digital competence of urban and rural secondary school teachers.
3. To investigate the difference in digital competence of secondary school teachers from government and private schools.

2. Sample and Sampling Techniques

The present study is descriptive survey research where a sample of 500 secondary school teachers was selected from both government and private schools in five districts of Himachal Pradesh viz. Bilaspur, Hamirpur, Kangra, Shimla and Una. The t-test was employed to determine the difference in digital competence of teachers in secondary schools concerning gender, locale and type of institution. The data was collected using a digital competence scale by Shipra Shrivastava and Kiran Lata Dangwal.

The paper posits the following hypotheses:

1. There exists a significant difference in the digital competence of male and female secondary school teachers.
2. There exists a significant difference in the digital competence of urban and rural secondary school teachers.
3. There exists a significant difference in the digital competence of secondary school teachers from government and private schools.

3. Results and Discussions

To test hypothesis 1 'there exists a significant difference in the digital competence of male and female secondary school teachers, a t-test was employed on the variable of digital competence.

Table 1 shows that the mean scores of male and female secondary school teachers in digital competence are 43.15 and 37.95 respectively and standard deviations for the same are 4.99 and 6.24 respectively. The value of the t-ratio is 10.23 which is significant at the .01 level showing that there exists a significant difference in the digital competence of male and female secondary school teachers. Hence the result confirms hypothesis 1 i.e., 'There exists a significant difference in the digital competence of male and female secondary school teachers'. Furthermore, because the mean score of male secondary school teachers was

Table 1. Mean, SD, and t-ratio of digital competence of secondary school teachers based on gender

Variable	Gender	N	Mean	SD	SE_D	t-ratio	p-value
Digital Competence	Male	239	43.15	4.99	0.32	10.23	.000
	Female	261	37.95	6.24	0.39		

Table 2. Mean, SD, and t-ratio of digital competence of secondary school teachers based on locale

Variable	Locale	N	Mean	SD	SE_D	t-ratio	p-value
Digital Competence	Urban	363	41.80	5.27	0.28	8.49	.000
	Rural	137	36.83	7.14	0.61		

Table 3. Mean, SD, and t-ratio of digital competence of secondary school teachers based on type of institution

Variable	Type of Institution	N	Mean	SD	SE_D	t-ratio	p-value
Digital Competence	Government	238	37.05	5.65	0.35	15.53	.000
	Private	262	44.18	4.48	0.29		

significantly higher than that of female teachers, it may be concluded that male secondary school teachers have higher digital competence than their female counterparts. The findings of Roussinos and Jimoyiannis[26], Grande-de-Prado *et al.*[27] and Choudhary[25] also supported the result whereas Caena and Redecker[28] found that digital competence was higher in females. However, studies by Casillas *et al.*[29] and Yovkova and Forsyth[30] reported that gender has no significant effect on the digital competence of teachers.

To test hypothesis 2 'there exists a significant difference in the digital competence of urban and rural secondary school teachers', a t-test was employed on the variable of digital competence.

Table 2 shows that the mean scores of urban and rural secondary school teachers in digital competence are 41.80 and 36.83 respectively and standard deviations for the same are 5.27 and 7.14 respectively. The value of the t-ratio is 8.49 which is significant at the .01 level showing that there exists a significant difference in the digital competence of urban and rural secondary school teachers. Hence the result confirms hypothesis 2 i.e., 'There exists a significant difference in the digital competence of urban and rural secondary school teachers.' Furthermore, because the mean score of urban secondary school teachers was significantly higher than that of rural teachers, it may be concluded that urban secondary school teachers have higher digital competence than their rural counterparts. The findings of NITI ayog report[31] and Arora and Matin[32] also supported the result. However, Radhamani and Kalaivani[33] and Reang and Mohalik[34] reported no significant difference in the digital competence of urban and rural secondary school teachers.

To test hypothesis 3 'There exists a significant difference in the digital competence of secondary school teachers from government and private schools', a t-test was employed on the variable of digital competence.

Table 3 shows that the mean scores of secondary school teachers from government and private schools in digital competence are 37.05 and 44.18 respectively and standard deviations for the same are 5.65 and 4.48 respectively. The value of the t-ratio is 15.53, which is significant at the 0.01 level. From Table 3, it is concluded that there is a significant difference in the digital competence of secondary school teachers working in government and private schools. Hence the result confirms hypothesis 3 i.e., 'There exists a significant difference in the digital competence of secondary school teachers from government and private schools.' Furthermore, because the mean score of secondary school teachers from private schools was significantly higher than that of teachers from government schools, it may be concluded that secondary school teachers from private schools have higher digital competence than teachers from government schools. The findings of Kumar and Subramaniam[35], Palmero *et al.*[36], and Choudhary[25] also supported the result. However, Motie *et al.*[37] reported no significant difference in the

digital competence of secondary school teachers from government and private schools.

4. Conclusions and Educational Implications of the Study

It has been found that digital competence among secondary school teachers differs significantly concerning gender (male/female), locale (urban/rural), and type of institution (government/private). It was also found that the digital competence of male secondary school teachers was significantly higher than that of female teachers. Urban secondary school teachers have higher digital competence than their rural counterparts, and secondary school teachers from private schools have higher digital competence than the teachers from government schools. This reveals that digital competence among secondary school teachers is significantly associated with gender, locale, and type of institution.

The finding of digital competence in male teachers is higher compared to female teachers necessitates the need for targeted interventions to minimize this gap. Education institutions need to consider offering training programs aimed at increasing the digital skills of women teachers. The difference in digital competence between teachers from urban areas and those from rural regions emphasizes the significance of bridging the digital divide. The measures enhancing technology accessibility need to be specifically designed to meet the needs of teachers teaching in rural areas so that they can effectively utilize digital tools while teaching. The variance in digital competence between government and private school teachers underscores the significance of institutional context. It also calls for policymakers and school administrators to provide more resources and support systems to government school teachers. This will help improve their ICT skills. The study thus recommends that ongoing programs should be created to accommodate the various demographics concerning digital literacy. Further, the recommendations from this study can aid in shaping curriculum development methods aimed at incorporating digital competence into teacher education programs.

5. References

1. Collins A, Halverson R. Rethinking education in the age of technology: The digital revolution and schooling in America. New York: Teachers College Press; 2018.
2. McLoughlin C, Lee M. Mapping the digital terrain: New media and social software as catalysts for pedagogical change. In: Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) Annual Conference 2008; Dec 1-3; Deakin University. Geelong (AU): ASCILITE; 2008. p. 641-52.
3. Greenhow C, Robelia B, Hughes JE. Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? Educ Res. 2009; 38(4):246-59. https://doi.org/10.3102/0013189X09336671
4. McKnight K, O'Malley K, Ruzic R, Horsley MK, Franey JJ, Bassett K. Teaching in a digital age: How educators use technology to improve student learning. J Res Technol Educ. 2016; 48(3):194-211. https://doi.org/10.1080/15391523.2016.1175856
5. Smith EE, Kahlke R, Judd T. Not just digital natives: Integrating technologies in professional education contexts. Australas J Educ Technol. 2020; 36(3):1-4. https://doi.org/10.14742/ajet.5689
6. Eshet Y. Digital literacy: A conceptual framework for survival skills in the digital era. J Educ Multimedia Hypermedia. 2004; 13(1):93-106. https://www.learntechlib.org/primary/p/4793/
7. van Deursen AJAM. Internet Skills: Vital assets in an information society. Enschede: University of Twente; 2010. https://doi.org/10.3990/1.9789036530866
8. European Commission. A digital agenda for Europe. COM (2010) 245 final. Brussels: Publications Office; 2010. Available from: https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF
9. Fillman SA. Educating 21st-century technology career professionals: Perspectives on soft skills.
10. Motorga ME. Digital transformation in adult education: empowering global understanding and sustainable development. Revista de Științe ale Educației. 2023; 48(2):46-63. https://doi.org/10.35923/JES.2023.2.04
11. European Parliament, European Council. Recommendation of the European Parliament and of the Council of 18 December 2006 on key competencies for lifelong learning. Official Journal of the European Union. 2006; L 394/10. Available from: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF
12. Calvani A, Cartelli A, Fini A, Ranieri M. Models and instruments for assessing digital competence at school. J E-Learn Knowl Soc. 2008; 4:183-93. https://doi.org/10.20368/1971-8829/288

13. Newman T. A review of digital literacy in 0-16 year olds: evidence, developmental models, and recommendations. London: Becta; 2008.
14. Ilomäki L, Kantosalo A, Lakkala M. What is digital competence? Brussels: European Schoolnet; 2011. https://core.ac.uk/reader/33734457
15. Ferrari A. Digital competence in practice: An analysis of frameworks. EUR 25351 EN. Luxembourg: Publications Office of the European Union; 2012. JRC68116. https://dx.doi.org/10.2791/82116
16. Sharma RK, Sharma D. Digital literacy and competence for educators. Scholarly Res J Humanity Sci and English Language. 2022; 10(50):12362-8. https://doi.org/10.21922/srjhsel.v10i50.10160
17. Krumsvik R, Egelandsdal K, Sarastuen N, Jones L, Eikeland OJ. SMIL-studien. Bergen: UiB/KS; 2013. Available from: https://www.iktogskole.no/wp-content/uploads/2014/05/Sluttrapport_SMIL.pdf
18. Janssen J, Stoyanov S, Ferrari A, Punie Y, Pannekeet K, Sloep P. Experts' views on digital competence: Commonalities and differences. Comput Educ. 2013; 68:473-81. https://doi.org/10.1016/j.compedu.2013.06.008
19. Falloon G. From digital literacy to digital competence: the Teacher Digital Competency (TDC) framework. Educ Technol Res Dev. 2020; 68(5):2449-72. https://doi.org/10.1007/s11423-020-09767-4
20. UNESCO. ICT competency framework for teachers. Version 2.0. Paris: UNESCO; 2011.
21. Alazam A, Bakar A, Hamzah R, Asmiran S. Teachers' ICT skills and ICT integration in the classroom: The case of vocational and technical teachers in Malaysia. Creative Education. 2012; 03:70-6. https://doi.org/10.4236/ce.2012.38B016
22. Fernandez-Batanero J, Colmenero-Ruiz M. ICT and inclusive education: attitudes of the teachers in secondary education. J Technol Sci Educ. 2016; 6(1):19-25. https://doi.org/10.3926/jotse.208
23. Hinojo-Lucena FJ, Aznar-Díaz I, Cáceres-Reche MP, Trujillo-Torres JM, Romero Rodríguez JM. Factors influencing the development of digital competence in teachers: Analysis of the teaching staff of permanent education centres. IEEE Access. 2019; 7:178744-52. https://doi.org/10.1109/ACCESS.2019.2957438
24. Moreno Guerrero AJ, Fernández Mora M, Godino Fernández AL. Digital teacher competence. Area of information and information literacy and its influence with age. Academo (Asunción). 2020; 7(1):45-57. https://doi.org/10.30545/academo.2020.ene-jun.5
25. Choudhary MA. A study of digital competency of secondary school teachers about gender and type of school. J Emerg Technol Innov Res (JETIR). 2024; 11(2):b829-35. http://www.jetir.org/papers/JETIR2402196.pdf
26. Roussinos D, Jimoyiannis A. Examining primary education teachers' perceptions of TPACK and the related educational context factors. J Res Technol Educ. 2019; 51(4):377-97. https://doi.org/10.1080/15391523.2019.1666323
27. Grande-De-Prado M, Cañón R, García-Martín S, Cantón I. Digital competence and gender: Teachers in training. A case study. Future Internet. 2020; 12(11):1-15. https://doi.org/10.3390/fi12110204
28. Caena F, Redecker C. Aligning teacher competence frameworks to 21st-century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu). Eur J Educ. 2019; 54(3):356-69. https://doi.org/10.1111/ejed.12345
29. Casillas S, Cabezas M, Ibarra MS, Rodríguez G. Evaluation of digital competence from a gender perspective. In: Proceedings of the 5th International Conference on Technological Ecosystems for Enhancing Multiculturality. 2017; 1-5. https://doi.org/10.1145/3144826.3145372
30. Yovkova B, Peytcheva-Forsyth R. Factors affecting the attitude of university professors towards the use of electronic resources in the education of disabled students. In: AIP Conference Proceedings. AIP Publishing. 2019; 2172(1). https://doi.org/10.1063/1.5133518
31. NITI Aayog. India. 2015. Retrieved from the Library of Congress: https://www.loc.gov/item/lcwaN
32. Arora S, Matin M. residence school locality and teaching subject stream influence on the digital competency of secondary school teachers: A comparative study. GIS-Zeitschrift für Geoinformatik. 2023; 8:1095-1102.
33. Radhamani K, Kalaivani D. Digital competence among secondary teachers. Science. 2023; 75(211.48):26-992. https://doi.org/10.21275/SR23608145016
34. Reang JJ, Mohalik R. ICT competency of secondary school teachers. Int J Creative Res Thoughts (IJCRT). 2023; 11(8):e351-e359. Available from: https://ijcrt.org/download.php?file=IJCRT2308469.pdf
35. Kumar SM, Subramanian A. Digital competence and techno pedagogical skills as criterion for teacher effectiveness of prospective teachers. Shodhganga. 2022. Available from: http://hdl.handle.net/10603/392510
36. Ruiz-Palmero J, Guillen-Gamez F, Tomczyk Ł. Permanent training as a predictor of success in the digital competence of Education teachers carrying out the online tutorial