Competencies needed by civil engineering teachers in the digital era

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Abstract. This study aims to obtain information about the competency of teachers needed to support learning in the digital era. The method of analysis used is a course of study by collecting the Journal of Research in 30 journals from 2015 – 2019. The obtained Data is compiled, analyzed and deduced. Data is attributed to competence in the technology of the tools, and to coordinate technology applications in learning. Findings of the analysis to visit that the competency of teachers in the application of tools such as computer or Laptop, Mobile Phone, camera, and the ability of teachers to activate applications such as Social Networking Service (SNS) or Social Media, Video Editor, Browser, Blogs and presentation applications are needed in the digital era.

1. Introduction
In today's digital civil engineering teachers are prosecuted more not only than just the mastery of the material required but having the competence in mastering the technology for teaching needs is also needed [1], because today human Being shifted from the traditional industrial community that has reflected the human life of the last few centuries, becoming a digital industry society that has a new framework [2], the ability in integrating new technologies will help Teachers in developing the teaching practice process [3].

Research related to the competencies of digital-era teachers such as, the creation of professional community networks, where teachers can take the sharing of materials resources, is a valuable support for the generation of new knowledge and growth Professional teacher [4]. The use of instructional design elements in the context of online learning has seen several proven developments that improve student engagement and motivation [5]. Online-based resource support allows teachers to engage students directly in the creation of teacher-directed learning materials, which can improve more intensive communication between teachers and students [6].

In practice many of the online-based learning features are effectively hampered by the low ability of teachers in the use of new technology and little is known about what teachers should do on online sites to get the impact Positive on their learning or practice [7]. When teachers begin to go online for professional learning, teachers should check how to direct his studies online [8], in this study not discussing how teachers apply online-based learning or measuring Skills in the integration of new technologies.

Previous research has suggested the need for teachers to master digital competence, it is important to understand the teacher feedback role that is synchronous and asynchronous in online learning, as both remain very important in student academic life [9]. But because of its objectivity, this research does not
provide a deeper understanding of how and why the physical attributes of these different spaces support or inhibit the learning process of online teaching [10]. This research aims to provide an overview of the competencies that the teachers need in the digital civil engineering.

2. Method
Methods of research using Systematic Literature Review. The first process is a journal search about teacher competence in the digital era of the base data source through Google Scholar and Crossref search engines. The base Data involved in the search was Elsevier which rises between 2015 to 2019. This study found that the competence of engineering teachers in the digital era provides a variety of capabilities in operating hardware and the ability to operate software, factors that can make additional references such as what civil engineering teachers need in the digital era.

3. Result and discussion
Based on the analysis of the literature that has been collected, we demonstrate that there are two additional things that must be strengthened by civil engineering teachers in the digital era apart from the understanding of civil engineering itself namely, operation hardware and operation software [11], information on additional competence is presented in table 1 and table 2. As mentioned earlier, the purpose of this research is to give an overview about the additional competence of civil engineering teachers in the digital era, because in this era the teacher's work is required to be more flexible so that students can learn every time easily and increased interaction with teachers [12], this can be done with teachers who have capabilities in the operation hardware and operation software that has [13], With that information teachers can study themselves in order to continue to grow in time because by facilitating students in learning and increasing interaction between students and teachers will assist in improving the outcomes of learning Teachers and students expectations [14].

3.1. Hardware operation
From the above exposure, it is known, that professional teachers in the digital era are teachers who in carrying out their duties as mentioned above are based on the use of digital technology supported networks [15]. Teachers in the digital era must have a qualified quality in order to become an inspiring educator, but that such teacher qualifications will not run if unaccompanied by the right device [16]. In order to educate students in the digital era it takes an internet-based device that can be easily accessed and used by teachers, of course this access not only contains the information base and subject matter of the science that is learned [17]. In addition, it must also have other features that will make the pupils more freely experimenting to master a particular branch of science. The activities must be supported by the capability of operation hardware [18], information about the hardware that must be mastered in the digital era is presented in table 1. There are three basic devices that teachers must master in the digital era, laptop/Computer, Smartphone/mobile phone, camera, with these three hardware teachers can provide interactive web-based learning and provide communication facilities between teachers and students, between students, and students with other learning resources [19]. The use of digital technology not only in teaching and learning activities, but also in carrying out other tasks, such as in the management of education administration, giving tasks, implementation evaluation and so forth [20,21]. In addition, teachers needed in the digital era are teachers who have proficiency in assessing the use of educational and non-educative technologies [22]. Teachers should continue to evaluate the ability of students needed to compete in the global economy. Teachers must also be lifelong learners and must be willing to learn not only from their peers, but also from their students as well [23].
The description of the additional competencies of civil engineering teachers about the ability to operate any hardware that must be mastered in the digital era, the ability to operate Laptop / Computer, Smartphone / Mobile, Camera is needed to support learning in the digital era.

3.2. Software operation
Professional teachers in the digital era are teachers who are proficient with information technology and a wide range of computer applications [24], even information accessed by pupils in the digital era is not limited to education-related information alone, but rather information relating to their personal interests, in relation to that teacher in the digital era should be able to utilize the available software [25]. Information about what basic software to be strengthened teachers in the digital era is presented in table 2. Students in the digital era have some traits that can be seen in everyday life [26]. It's like a love and often communicates with all circles, especially through Social Networking Service, such as Facebook, Twitter, or SMS [27]. A learning strategy that includes teaching, discussion, reading, assignment, presentation and evaluation, in general its reliability depends on one or more of the three basic modes of communication done by means of communication between teachers and students; Between students and learning resources, and communication among students [28]. If these three aspects can be held with the appropriate composition, it is expected that the learning process is optimal. The success of achieving the objectives of learning is determined by the balance between the three aspects. It is also stated that the planning of learning by prioritizing the balance between the three communications is essential to the WEB-based learning environment [11]. The management of learning can be interpreted as an effort to make the arrangement, recording, storage and service of things related to learning activities, such as student attendance list, curriculum and syllabus, List of daily values, Weekly, monthly and semiannual, exam questions, teaching materials, and so forth. All these things can be stored using digital technology, and in certain parts can be accessed by pupils [29,30].

Table 1. Hardware operation.

| No | Type                |
|----|---------------------|
| 1  | Laptop/ Computer    |
| 2  | Smartphone/Mobile phone |
| 3  | Camera              |

The description of the additional competencies of civil engineering teachers about the ability to operate what software should be in the digital era, the ability to operate Social Networking Service, Video Editor, Browser, Blog is needed to support learning in the digital era.

4. Conclusion
Professional teachers in the digital era are teachers who have more competence in the needs of hardware and software, in this implementation requires understanding of digital technology with various kinds and variety. Thus, professional teachers in the digital era are teachers who can carry out their professional tasks based on digital technology. The use of digital technology can be done by the teacher...
on teaching and learning activities, administrative services, assignments and evaluation. Therefore, the deprecation of teachers against Hardware and software must be provided in a complete and sustainable manner. The existence of digital technology can help teacher roles especially on teaching aspects.

References

[1] Tømte C, Enochsson A B, Buskqvist U and Kårstein A 2015 Educating online student teachers to master professional digital competence: The TPACK-framework goes online Computers & Education 84 pp 26-35
[2] Horasanl E B and Ortaçtpe D 2016 Reflective practice-oriented online discussions: A study on EFL teachers' reflection-on, in and for-action Teaching and Teacher Education 59 pp 372-382
[3] Tsybulsky D and Levi I 2019 Science teachers' worldviews in the age of the digital revolution: Structural and content analysis Teaching and Teacher Education 86 pp 102921
[4] Atapattu T, Thilakaratne M, Vivian R and Falkner K 2019 Detecting cognitive engagement using word embeddings within an online teacher professional development community Computers & Education 140 pp 103594
[5] Adukaite A, Zyl IV, Er S and Cantoni L 2017 Teacher perceptions on the use of digital gamified learning in tourism education: The case of South African secondarieschools Computers & Education 111 pp 172-190
[6] Kleinmehtha M and Grööschnner A 2016 Fostering preservice teachers' noticing with structured videofeedback: Results of an online- and video-based intervention study Teaching and Teacher Education 59 pp 45-56
[7] Bates M S, Phalen L and Moran C G 2016 If you build it, will they reflect? Examining teachers' use of an online video-based learning website Teaching and Teacher Education 58 pp 17-27
[8] Broadbent J and Poon W L 2015 Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review Internet and Higher Education 27 pp 1-13
[9] Ene E and Upton T A 2018 Synchronous and asynchronous teacher electronic feedback and learner uptake in ESL composition Journal of Second Language Writing 41 pp 1-13
[10] Byers T, Imms W and Young E H 2018 Evaluating teacher and student spatial transition from a traditional classroom to an innovative learning environment Studies in Educational Evaluation 58 pp 156-166
[11] Rutherford T, Long J J and Farkas G 2017 Teacher value for professional development, self-efficacy, and student outcomes within a digital mathematics intervention Contemporary Educational Psychology 51 pp 22-36
[12] Hou H 2015 What makes an online community of practice work? A situated study of Chinese student teachers' perceptions of online professional learning Teaching and Teacher Education 46 pp 6-16
[13] Instefjord E J and Munthe E 2017 Educating digitally competent teachers: A study of integration of professional digital competence in teacher education Teaching and Teacher Education 67 pp 37-45
[14] Hatlevik I K R and Hatlevik O E 2018 Students' evaluation of digital information: The role teachers play and factors that influence variability in teacher behavior Computers in Human Behavior 83 pp 56-63
[15] Kim M K, Xieb K and Cheng S L 2017 Building teacher competency for digital content evaluation Teaching and Teacher Education 66 pp 309-324
[16] Webera K E, Gold B, Prilop C N and Kleinmehcht A 2018 Promoting pre-service teachers' professional vision of classroom management during practical school training: Effects of a structured online- and video-based self-reflection and feedback intervention Teaching and Teacher Education 76 pp 39-49
[17] Yurkofsky M M, Smith S B and Brennan K 2019 Expanding outcomes: Exploring varied conceptions of teacher learning in an online professional development experience Teaching
[18] Kleinknecht M and Gröschner A 2016 Fostering preservice teachers’ noticing with structured videofeedback: Results of an online- and video-based intervention study *Teaching and Teacher Education* **59** pp 45-56

[19] Rosenberg H, Ophir Y and Asterhan C S C 2018 A virtual safe zone: Teachers supporting teenage student resilience through social media in times of war *Teaching and Teacher Education* **73** pp 35-42

[20] Suh S and Michener C J 2019 The preparation of linguistically responsive teachers through dialogic online discussion prompts *Teaching and Teacher Education* **84** pp 1-16

[21] Wang J X, Tigelaar D E H and Admiraal W 2019 Connecting rural schools to quality education: Rural teachers’ use of digital educational resources *Computers in Human Behavior* **101** pp 68-76

[22] Nagle J 2018 Twitter, cyber-violence, and the need for a critical social media literacy in teacher education: A review of the literature *Teaching and Teacher Education* **76** pp 86-94

[23] Tang E and Chung E 2016 A study of non-native discourse in an online community of practice (CoP) for teacher education *Learning, Culture and Social Interaction* **8** pp 48-60

[24] Beach P 2017 Self-directed online learning: A theoretical model for understanding elementary teachers’ online learning experiences *Teaching and Teacher Education* **61** pp 60-72

[25] Neumann K L and Kopcha T J 2019 Using Google Docs for Peer-then-Teacher Review on Middle School Students’ Writing *Computer and Composition* **54** pp 102524

[26] Parsonsa S A, Hutchisona A C, Hall L A, Parsons A W, Ives S T and Leggett A B 2019 U.S. teachers’ perceptions of online professional development *Teaching and Teacher Education* **82** pp 33-42

[27] Powell C G and Bodur Y 2019 Teachers’ perceptions of an online professional development experience: Implications for a design and implementation framework *Teaching and Teacher Education* **77** pp 19-30

[28] Ungar A O and Baruch A F 2018 Professional identity of teacher educators in the digital era in light of demands of pedagogical innovation *Teaching and Teacher Education* **73** pp 183-191

[29] Song H, Kim J and Luo W 2016 Teacher-student relationship in online classes: A role of teacher self-disclosure *Computers in Human Behavior* **54** pp 436-443

[30] Tsiotakis P and Jimoyiannis A 2016 Critical factors towards analysing teachers’ presence in online learning communities *Internet and Higher Education* **28** pp 45-58