

Judul Artikel: ICT literacy of high school mathematics teacher: online learning competence with heutagogical approach

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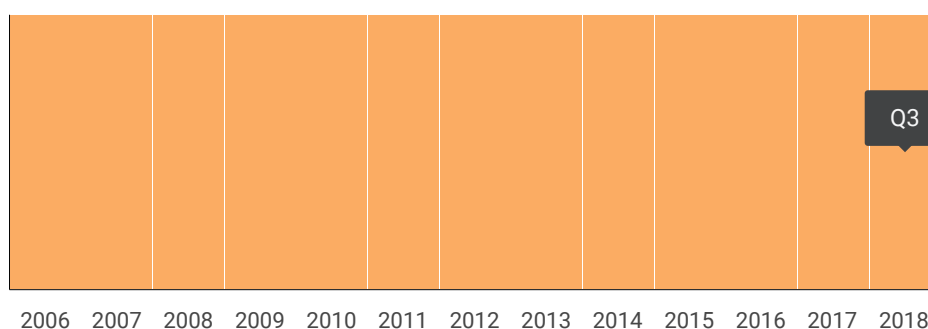
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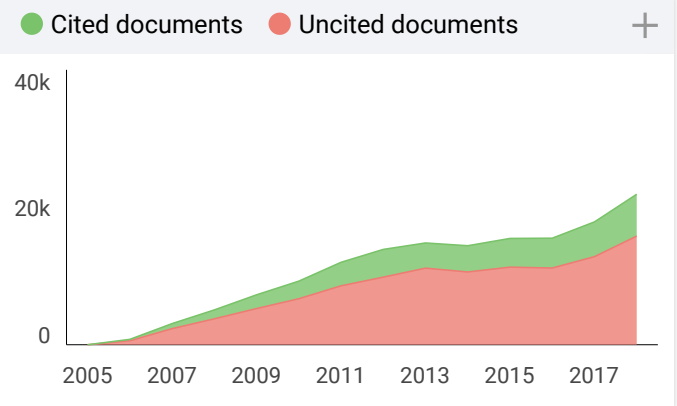
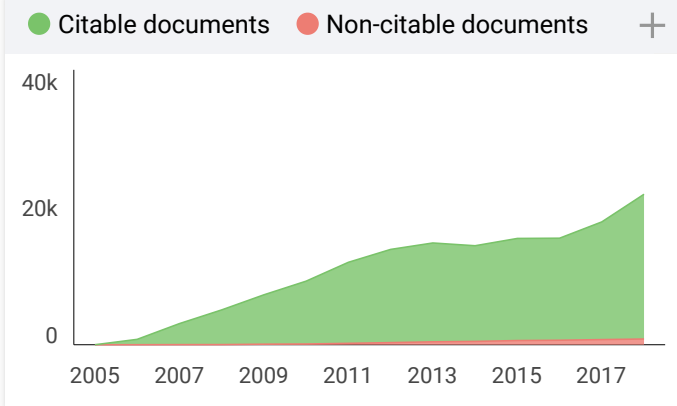
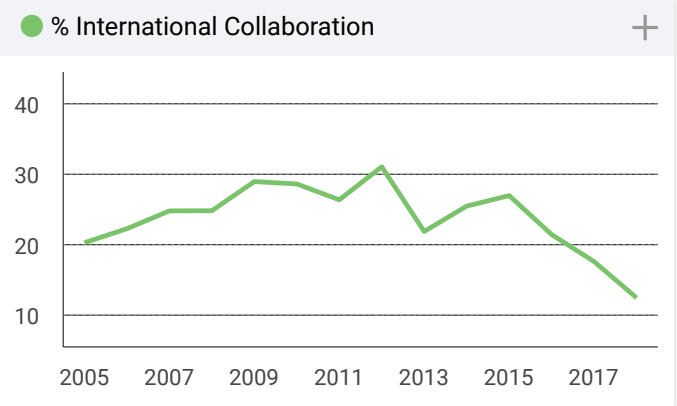
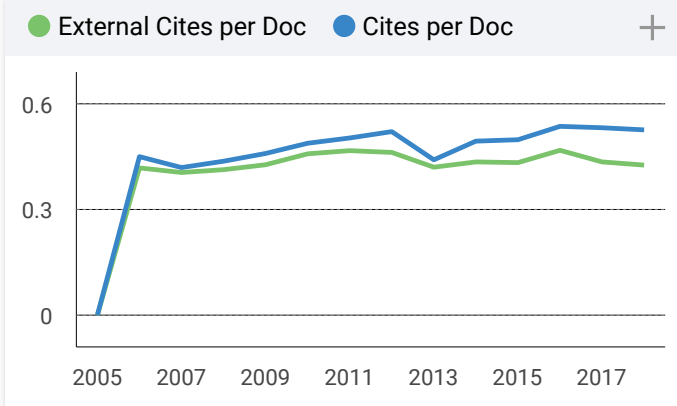
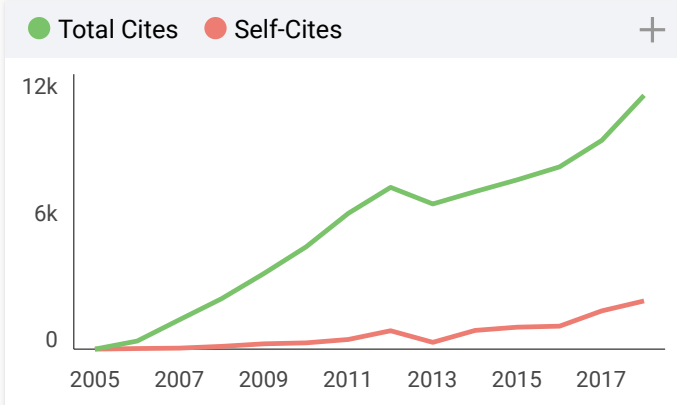
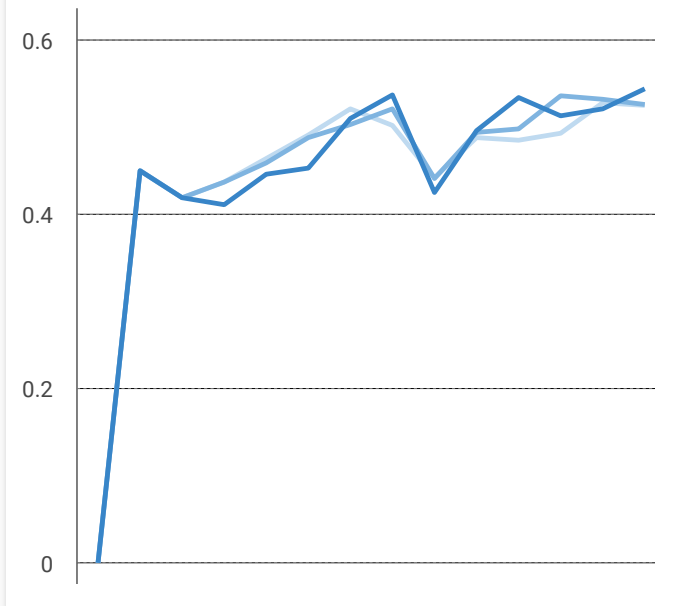
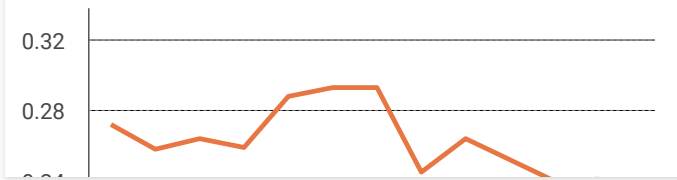
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Preface

It is a very great privilege for Faculty of Mathematics and Natural Science (FMIPA) Universitas Negeri Semarang to host the 5th International Conference on Mathematics, Science, and Education (ICMSE 2018) in Kuta, Bali, Indonesia on 8-9 October 2018. We are honored to have the opportunity to work with Indonesian Chemical Society, Indonesian Physical Society, Indonesian Biology Society, Association of Computer Science Higher Education, Indonesian Mathematical Society, and Association of Indonesian Science Educator in this forum. In 2018, our theme of “Collaborative Research on Science, Mathematics, and Education: Its Application As The Development of Sustainable Resources” celebrates the annual conference to provide a platform to the researchers, experts and practitioners from academia, governments, NGOs, research institutes, and industries to meet and share cutting-edge progress in the field of mathematics, natural science, and science education. Also, this event provides an opportunity to enhance understanding of relationships between knowledge and research in the scope of Mathematics, Biology, Chemistry, Physics, and Science Education.

The committee of ICMSE 2018 would like to express the sincere gratitude to the keynote speakers and all authors of the contributed papers in the conference proceedings. Moreover, would like to thank the expert reviewers for reviewing the manuscripts. We also highly appreciate the assistance offered by many volunteers in the preparation of the conference and the proceedings, and of course, to the sponsors assisting in funding this conference.

The committee selected papers and report findings presented in this forum to be published in **Journal of Physics: Conference Series (Institute of Physics Publisher)** indexed in some databases, including the Conference citation index, Scopus, Inspec, Chemical Abstracts Service, and Astrophysics Data System. We hope that this program will expand the mutual understanding and respect in stimulating research in Mathematics, Science, and Education; share research interest and information, and create a form of collaboration and build a trust relationship. We are delighted to be able to show the world what recent developments in the field of Mathematics, Natural Science, and Science Education through this fruitful program.

Chairperson,

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ICT literacy of high school mathematics teacher: online learning competence with heutagogical approach

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Abstract. The purpose of this study is to determine the level of literacy of high school mathematics teachers. This research is a descriptive research that describes the literacy of high school mathematics teachers based on the analysis of questionnaires that are filled by teachers who come to the Center for Development and Empowerment of Mathematics Teachers and Education Personnel (CDEMTEP/ PPPPTK Matematika) and teachers who access PPPPTK Matematika's web, followed by high school mathematics teachers from various provinces in Indonesia. The research was conducted from May 5 to June 29, 2018. The results showed: (1) ability to use basic computer 55.07% good, and 44.93% moderate; (2) ability to create and use ICT-based learning media 7.97% good, 82.61% moderate, and 9.42% less; (3) ability to use Internet 39.13% good, and 60.87% moderate; and (4) the ability to use social media, the data obtained shows that five respondents did not answer. One respondent answered that they did not have social media. Most of the respondents have more than one social media. 52% of respondents who answered stated using WhatsApp. Ninety-three percent of respondents stated using Facebook. 52.27% of respondents use more than one social media.

1. Introduction

Heutagogy is a learning approach that emphasizes self-directed learning and self-determining learning. The heutagogical approach can be viewed as a progression from pedagogy to andragogy to heutagogy, with learners likewise progressing in maturity and autonomy [1]. More mature learners need less instructor control and course structure and can be more independent in their learning, while less mature students need more structural guidance and course scaffolding.

Heutagogy relates to learner-centered learning that sees students as the main agents in their own learning, which occurs as a result of personal experience. Heutagogy, the study of self-determined learning, can be seen as a natural development of previous educational methodologies - especially from the capacity building - and may provide an optimal learning approach in the 21st century [2]. Research shows that the longer the teaching experience of a teacher, the higher the teacher's independent learning [3].

Heutagogy is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human resources and material for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. Heutagogy provides a learning framework that addresses the needs of students, who must learn in an ever-changing environment that is complementary, complicated and unpredictable; the heutagogical approach helps them become lifelong students [2]. The heutagogy approach is a learning



approach with the concept of double-loop learning and self-reflection [4]. The scheme of Double loop learning can be seen in Figure 1.

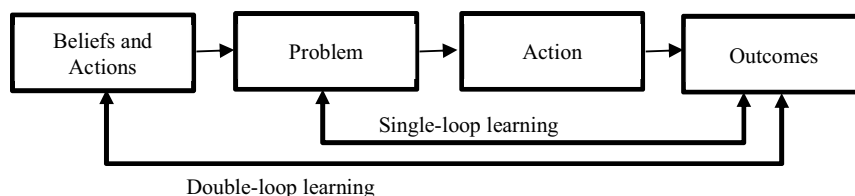


Figure 1. Double loop learning

Distance education (Online learning) supports heutagogy facilitated by web 2.0 support. New interest in heutagogy has been generated by Web 2.0 as a result of social media capabilities that complement and support this learning approach. Heutagogy has been referred to as a "net-centric" theory that takes advantage of Internet capabilities; where the pedagogical approach can be applied with the emergence of technology in distance education, as well as functioning as a teaching and learning framework for the digital era [5]. Web 2.0 allows users to create and share information on the web and interact with others interactively, users do not need special skills to do this, with Web 2.0, everyone can easily create their own material and publish or communicate it to groups of friends and colleagues, or to viewers around the world [1]. The Web 2.0 application allows users to change web content on multiple websites. On the other hand, they can keep in touch with friends, organize meetings, exchange news and photos.

Distance education and heutagogy also have several similarities, such as learner autonomy and self-direction, and have pedagogical roots in adult teaching and learning. In particular, heutagogy has the potential to be a theory of distance education, in part because of the ways in which heutagogy further broadens the andragogical approach and also because of the capabilities offered when applied with the emerging technology in distance education such as Web 2.0 [6].

The effectiveness of the use of ICT in schools depends on the actual practices that the teacher makes and on the teacher's ability to integrate ICT into their teaching process [7]. Thus teachers need to be literate in ICT, where this can be obtained through training. Teacher training in ICT can take many forms. Teachers can be trained to learn HOW to use ICT or teachers can be trained by VIA ICT. ICT can be used as the core or means for the teacher training process [8]. ICT literacy is closely related to the development of skills such as creativity, logical reasoning, creativity and problem solving, decision making, etc [9].

Online training is the implementation of training VIA ICT teachers. If you are going to join VIA ICT, then you must have ICT competence or liters. Likewise, if you want to take part in online training with a heutagogical approach, ICT conferences or literacy are important for teachers. This research is a research to find out the ICT literacy skills of high school mathematics teachers in Indonesia, as a preliminary study if there will be an online training with a heutagogical approach for high school mathematics teachers.

2. Method

This research is a quantitative descriptive study of ICT literacy skills of high school mathematics teachers. In this study the data to be obtained about the ICT literacy skills of high school mathematics teachers is related to the following aspects: (1) the ability to use a basic level computer; (2) the ability to make and use mathematics learning media; (3) the ability to use the internet; (4) the ability to use social media. This research was conducted by filling out a questionnaire given to high school mathematics teachers who came to PPPPTK Mathematics and online. Samples from this study were 138 high school mathematics teachers from various regions in Indonesia. The research was conducted from May 5 to June 29, 2018.

Data processing will see the level of ability of each of the aspect. Data processing uses linked scales from 1 to 4, where 1 is the lowest value while 4 is the best value. There are three criteria for the results of this study, namely the criteria of "good" if it is on a scale of 4, " moderate" if it is on a scale of 2 or 3, and "less" if it is on a scale of 1.

3. Result and Discussion

The results of research on ICT literacy ability of high school mathematics teachers here are seen in aspects: (1) the ability to use a basic level computer; (2) the ability to make and use mathematics learning media; (3) the ability to use the internet; and (4) the ability to use social media. The results obtained are as follows.

- (1) The ability to use basic computers is 55.07% good, and 44.93% moderate

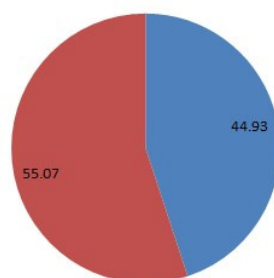


Figure 2. Ability to use basic computers

The ability to use basic computers here includes using word processors to write scripts, type in word processors using mathematical symbols and equations, and using PowerPoint to make simple presentations. Several statements related to this are: I can type common scripts in Ms. Word, I can type in Ms. Word using mathematical symbols and equations, I can make simple presentations with PowerPoint. From the data obtained it can be seen that the ability of the teacher in using basic computers is 55.07% good, and 44.93% moderate (Figure 2).

- (2) The ability to make and use ICT-based learning media 7.97% good, 82.61% moderate, and 9.42% less.

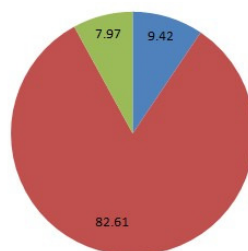


Figure 3. Ability to create and use ICT-based learning media

The ability to create and use ICT-based learning media includes the ability in terms of writing symbols and equations using the word, running mathematics learning media that have been created using Excel, PowerPoint and GeoGebra in the classroom, making mathematics learning media using Excel, PowerPoint or GeoGebra. Several statements related to this are: I have used Excel as mathematics learning media, I can add pictures, sounds and videos in PowerPoint presentations, I can add animation in PowerPoint, I've used GeoGebra in mathematics learning, I can make mathematics learning media use GeoGebra. From the data obtained it can be seen that the ability of the teacher in making and using ICT-based learning media is 7.97% good, 82.61% moderate, and 9.42% less (Figure 3).

(3) The ability to use the Internet results is: 39.13% good, and 60.87% moderate;

The use of Web-Based Learning Resources can support the development of an effective and enjoyable teaching and learning environment [10]. Thus the teacher's ability to use the internet becomes important. The ability to use the Internet here includes connecting a computer with tethering at a cellphone, surfing the internet, searching the internet and using email. Several statements related to this are: I can connect the Internet to a laptop using tethering via cellphone, I can use a search engine, I have email. From the data obtained it can be seen that the ability of the teacher in using the Internet is 39.13% good, and 60.87% moderate (Figure 4).

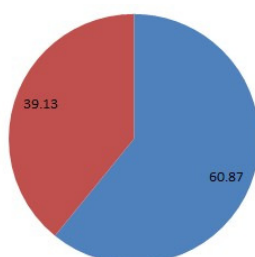


Figure 4. Ability to use the Internet

(4) The ability to use social media.

Beginning of the 21st century there are significant social trends where people access, use, and make information and knowledge very different from before, this is because of the ubiquitous availability of ICT [11]. Thus the use of social media on ICT literacy is important in using and making the information as well as knowledge. The ability to use social media includes the use of social media commonly used by teachers, like WA, Facebook, Instagram, Line, and Telegram. The statement regarding this is that I have an account and often use social media. The data obtained shows that five respondents did not answer. One respondent answered that they did not have social media. Most of the respondents have more than one social media. Fifty-two percent of respondents who answered stated using WhatsApp. There is Ninety-three point two percent of respondents stated using Facebook. There is fifty-two point two seven percent of respondents that use more than one social media.

Looking at the results above, in general, it can be said that ICT literacy of high school mathematics teachers is good, which if we recap the results of the four aspects are given in Table 1.

Table 1. Four aspects of ICT literacy in high school mathematics teachers

No.	Description	Results
1.	The ability to use a basic level computer	55.07% good, and 44.93% moderate.
2.	The ability to make and use mathematics learning media	7.97% good, 82.61% moderate, and 9.42% less.
3.	The ability to use the internet	39.13% good, and 60.87% moderate.
4.	The ability to use social media	5 respondents did not answer; 1 respondent did not have social media; 52% who answered stated using WhatsApp; 93.2% respondents stated using Facebook; 52.27% respondents use more than one social media.

4. Conclusion

Based on the explanation given above, we can take the following conclusions: (1) The ability of teachers in mastering information and communication technology will be very useful in following online learning. (2) Online learning has been widely supported by existing facilities, such as the emergence of Web 2.0 technology. With this technology, teachers will be happier to follow online learning also

enables teachers to be more creative [12]. Web 2.0 technology is meant for example Facebook, Moodle, twitter, blog, and others [1]. (3) The character of online learning that encourages independence, encourages creativity, and there is a reflection in learning, is very compatible with the heutagogical learning approach. (4) ICT skills are important in conducting online learning with the heutagogical approach. Data obtained about ICT literacy skills of mathematics teachers in Indonesia shows that many teachers who have ICT literacy skills, in general, are good so that they support learning through the heutagogical approach.

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