Social Media-Based Cartoon Riddles as a Form of Teaching Materials Development to Assess Algebra Numeracy in 4.0

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Abstract. The era of society 4.0 provides a change in people's social lives, where social media becomes the main source of information. One of the common posts on *Facebook, Instagram, Whatsapp, Twitter,* etc is the cartoon riddle related to algebra operations. Many users respond to those posts, so that their algebra numeracy can be observed actively. However, many children still encounter difficulties in mastering those skills. Algebra material is the basis for understanding higher mathematical concepts; so that when students' algebraic numeracy is weak, they will have difficulty in further reasoning mathematical concepts. The aimed of this study will discuss the development of teaching materials through social media based cartoon riddles that can assess algebraic numeracy. This is literature study used descriptive method without giving special treatment. This study collect the joutnal, books, and the other paper. The result of this study show that social media based-cartoon riddle is one form of teaching development materials that we can use for learning mathematics in measuring students' basic algebraic arithmetic skills

Keywords: Algebraic Expertise; Internet Usage; Cartoon Drawings; Social Networking

1 Introduction

Mathematics is one of the leading scientific disciplines in the world of education. The characteristic of mathematics is very close to the abstract conceptual reasoning logic of a person. However, what is the primary content for learning mathematics is the ability to count. The ability to count is usually introduced early. What is usually introduced is to count the number of natural numbers. Along with the physical development, the abstract reasoning ability of a person also increases, so that the ability to count also increases, not only recognizing the number of things but also being able to perform operations such as counting numbers, adding, subtracting, multiplying, and dividing.

Algebra material is the basis for understanding higher mathematical concepts so that when the essential ability to calculate algebra is weak, students will have difficulty to reason mathematical concepts further. In line with the National Council of Mathematics Teachers which states that algebra learning should be aimed at developing students' abilities in (1) understanding patterns, relationships, and functions; (2) representing and analyzing mathematical situations using algebraic symbols and procedures; (3) using mathematical models

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to express and understand quantitative relations; and (4) analyzing changes in various contexts[1]. In addition to NCTM, in line with what Drijvers et al.said, algebraic expertise requires a link between necessary skills and symbol sense. An element will not be formed without the existence of other elements; for example, students cannot reason algebraically if they cannot do algebra operations and vice versa students often need algebraic reasoning to do algebra operations.However, most students still find it challenging to master the necessary skills of algebra. Algebra is not an easy concept either to learn or to teach [2]. Many students have difficulty learning algebra, so they have deep algebraic expertise.

Industry era 4.0 provides a change in social life in society, where social media is the primary informant. In this current phenomenon, there are often cartoon riddles questions that are related to algebraic arithmetic operations that are uploaded by social media. Social media usually uploads questions on Facebook, Instagram, WhatsApp, Twitter, and so on. Millennials spend most of their time with gadgets, therefore learning through social media will have a significant influence on the learning process; one of them is on learning mathematics. The students' basic algebraic math skills can be identified actively on social media. Based on the description above, the researcher is eager to know how the basic abilities of arithmetic algebra through social media-based cartoon riddles as a form of development of teaching materials in the 4.0 industrial era**.**

2 Method

This study is a descriptive method without giving special treatment. The writer focuses on literature studies about algebra numeracy, internet usage of teaching materials, and cartoons riddles by social media. This study collected by journals, books, and the other paper.

3 Result and Discussion

1. Basic skills on Algebra Numeracy

Drijvers, Goddijn, and Kindt use the term 'algebraic expertise,' which refers to the ability of students to use algebra. They argue that algebraic expertise includes not only the mastery of necessary skills but also symbol sense[2]. Essential skills include procedural work and emphasizing algebraic calculations. Examples of basic algebraic skills are simplifying or describing algebraic forms and carrying out procedures for solving equations. On the other hand, symbol sense is more than just calculation. According to Arcavi, symbol sense plays a vital role in the coordination and interpretation of basic algebraic operations. Symbols include strategic skills and abilities in algebraic reasoning[3]. Strategic skill is the ability to make and/or choose effective strategies and find alternative strategies.

Algebraic reasoning abilities include qualitative reflections on the form of algebra and its application. Furthermore, algebraic reasoning also includes the process of generalizing experiences with numbers and calculations, formalizing ideas using meaningful symbol systems, and exploring concepts of patterns and functions [4]. Kaput mentions that there are

three aspects of algebraic reasoning, namely (1) the study of the structure of number systems, as in arithmetic (this is related to the view that algebra as a generalization of arithmetic or algebra as generalized arithmetic), (2) study of patterns , relationships, and functions, (3) the process of mathematical modeling, including the meaningful use of symbols. These three aspects are related to generalization and symbolization[5].

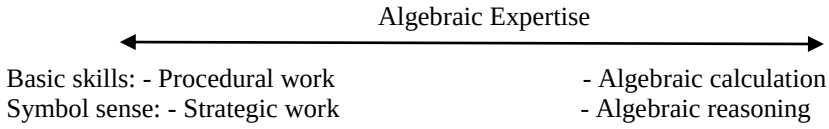


Fig 1. Algebraic expertise as a dimension consisting of basic skills and symbol sense (Drijvers, Goddijn, & Kindt, 2010, p. 22)

According to Drijvers et al, algebraic expertise requires a link between basic skills and symbol sense. An element will not be formed without the existence of other elements; for example, students cannot reason algebraically if they cannot do algebra operations and vice versa, students often need algebraic reasoning to do algebra operations[2]. Such relations indicate that teachers need to facilitate students to master these two elements. The essence of algebraic expertise is how students can link procedural work with strategic work and algebraic calculation with algebraic reasoning.

The abilty to calculate basic of algebra numeracy is different the ability to count aritmethic as usual. Skill of algebra numeracy also need symbolic too, in his journal Pierce stated that the goals achieved is different from etimates in arithmetic. It is meant that students need to develope in predicting pattern and understanding symbolic operation[6].

The abilty of algebra can be improved by practicing working on problemsd or tasks related to algebraic symblos continuously. By giving assignments or questions continuosly to students the teacher can find out the development of algebraic abilities. This is same with Arthur said that the ability of students past and present can be used as a new target in a learning[7].

Reid, as an orthopedagogist in the field of learning difficulties in Jamaris Martini, also suggests that the difficulties experienced by children are as follows: a. Weaknesses in counting, b. Difficulties in transferring knowledge, c. Understanding of lacking mathematical language, d. Difficulties in visual perception. Based on the explanation above, it shows that the essential ability to count algebra is a critical component possessed by students because, with an excellent algebraic counting ability, it will make it easier for a child to understand advanced mathematics which requires higher reasoning[8].

Increasing the ability of algebra in mathematics learning lies on the evaluation instruments which made students understand the basic of algebra concept well. As stated by Bookhove that a good evaluation instrument is an appropriate digital and makes concrete in learning goals[9]. He expects there technplogy-based algebra education. Beside that, Bookhove also stated that digital interventions have the potential to acquire algebraic expertise[10].

2. Utilization of the Internet as a Media for Teaching Materials

The rapid technological advances in the 4.0 era have also had a significant influence on the changes in various aspects of life, one of which is in the field of education. With the advancement of technology, it makes the development of teaching materials, for example, such as media in teaching materials, which must be updated by teachers in schools. In line with Warsita, he argues that the growth rate of users of information technology and the internet shows

figures that are so fantastic, even the internet has become a part of needs in a household and education unit[11]. This phenomenon shows that in this era, information technology will master most of the learning patterns of students.

The era of 4.0 society, the use of internet media has become a significant part of life, as well as in learning. In line with Munadi in his book, he says that the internet has a significant effect on the learning process and results both inside and outside the classroom[12]. Utilization of the internet allows the process of independence, acceleration, enrichment, expansion, effectiveness, and productivity in the implementation of the learning process. The internet is a global network that connects thousands and even millions of computer networks and personal computers, allows each computer that is connected contact many other computers anytime and from anywhere in the hemisphere to send news, obtain information or transfer data [13].

Learning by using internet media is expected to stimulate students to learn more independently according to their potential. Based on Cobine's statement, "Through independent study, students become doers as well as thinkers" This shows that independent learning makes students both actors and thinkers [14]. Thus, with the use of the internet as a learning system, it is enough to reduce distance and make the time more efficient between teachers and students.

Learning is a process of interaction between teachers and students, so it needs social networking in the use of the internet in learning. There are still many teachers who have not looked at the use of social networking on the internet as an alternative learning system in the era of 4.0 society. Nowadays, social networking sites are very familiar among millennials so that they have the potential to be used as a learning tool, to replace the function of learning management system software. Learning management system software is less popular with social networks that have advantages because it can be used without having to rent or manage a server, and the most important thing is to be more familiar with students.

Patria & Kristianus in an article, convey so many features offered by social networks that can be used by users to facilitate the process of interaction between fellow users[15]. Various features offered by social networks which can also be a learning medium, in further exploration, to support effectiveness and efficiency in the implementation of the learning process.

Social networking sites like Facebook, Twitter, Instagram, and so on seem to be a significant need for everyone, and they are prevalent among millennials. Among educators and students, Facebook and Instagram are accessed every day where various communities start to emerge. Social networking sites can be used as a new alternative that can be utilized in the world of learning. The use of social networking has become one of the efforts to increase students' enthusiasm for learning which is ultimately expected to increase their potential, especially in their scientific and academic abilities. The broad community currently has many social networking accounts, and it can be put to good use to support the learning process, so students have more variety in the learning process.

Nowadays milenial generation was depend on social media. Era society 4.0 can be said "always on" style, where social media will be on 24 hours and the most importance information for them. Baird said that teknologi dapat meningkatkan pembelajaran dalam memberikan ilmu pengetahuan yang sesuai dengan gaya hidup anak milenial jaman sekarang[16].

Most students log in to their social network accounts more than once a day. As a result, students forget the time in using social networking sites, thus diverting the time that should be used for more useful things such as learning or other more productive activities. That is because social networking is easier to use since it can not only be accessed in class during lessons, but it also can be accessed from anywhere even through a personal cellphone. Besides that, the advantages of the social network itself is that social media network has more exciting features

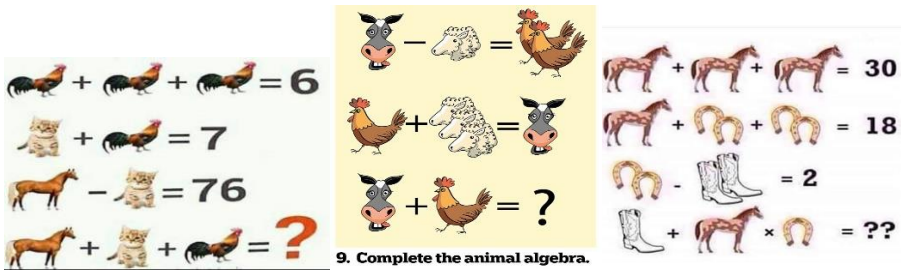
and contains the up to date information, so it makes people now will not be separated from social networking life.

Chaidar states that an educator should be observant to see the developments by utilizing social networks to interact more personally with the students[17]. It allows teachers to be a good director as well as a supervisor for the students both within the school and outside of school. Examples of social networks that are commonly used today are Facebook and Instagram, where teachers can create a group there. The group consists of students or classes of a subject which is being taught. In the group, the teachers can share teaching material by uploading the intended teaching material file such as pdf, word, or powerpoint or other files. In that way, the students can download material files wherever and whenever they need. Regarding communication, by utilizing existing group facilities, the students can also ask directly to the teacher about material that is not yet understood, as well as other group participants can also listen to these questions interactively. It is the same as when the teacher stands in the class.

The advantages of social media-based learning beside able to make learning more interesting and independent for students, this learning also can improve skill of learning goals. In line with Nookhong from his study stated that developed instruction model with collaborative learning using case-based learning via cloud technology and social media can be used for enhancing problem-solving skills and ICT literacy, and improve the instruction as a whole effectively[18].

3. Questions of Social Media-Based Cartoon Riddles

Social media is the primary informant nowadays. Trending topics will be seen by the existence of social media that shares information with the public through various social media such as Facebook, Instagram, Path, WhatsApp, and so on. At this time, some questions are often risen related to mathematics by social media, and the trending topic is raised because many people (netizens) who respond which is related to algebra. Blankenship stated there are 5 literacies of social media: 1) Attention: The ability to know where and when to place one's attention when navigating various types of social media 2) Participation: This is a question of being a good participant 3) Collaboration: Online communities are designed to thrive via collaboration 4) Network Awareness: How a social media network operates 5) Critical Consumption: We need to be able to evaluate what we're seeing and hearing [19]. The display of the questions is in the form of various images that make sense with algebraic logic as follows.



9. Complete the animal algebra.

Fig 2. Algebra Riddles

Based on the picture above, it is clear that the concept of the cartoon riddle uses the concept of algebra to solve it, but there are few traps that we must pay attention to in the pictures. Therefore, this cartoon riddle can indirectly measure a person's basic algebraic counting skills by using the logic of numeracy that they have. So, it is indispensable to develop teaching materials to measure the ability to count algebra based on social media-based cartoon riddles questions, and it can be an interesting source for students' worksheets when the are learning algebra. Besides, technological developments are so rapid in the 4.0 era, while we are also preparing for the 5.0 era. We can also make this cartoon picture riddle a resource in making mathematical game applications that can hone one's algebraic arithmetic skills.

The questions picture above can make students more interesting in honing their algebraic expertise. They will be more relaxed to answer the questions about algebra. As a result study of Maharani stated that cartoon-based mathematics learning media which is suitable for learning media to decrease students' anxiety[20].

4 Conclusion

The social media based-cartoon riddle is one form of teaching development materials that we can use for learning mathematics in measuring students' basic algebraic arithmetic skills. The development of teaching materials using internet media with social media networking sites can make students more independent to learn and explore their potential so that with the cartoon riddle, the students become more honed in the ability to count algebra and create a learning system for mathematics that is more fun and exciting.

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References

[1] NCTM. (2000). Principles and Standard for School Mathematics. Reston: Author.

[2] Drijvers, P., Goddijn, A., & Kindt, M.. (2010). Algebra education: Exploring topics and themes. In P. Drijvers, (Ed.), Secondary Algebra Education: Revisiting topics and themes and exploring the unknown (pp. 5– 26). Rotterdam: Sense Publishers.

[3] Arcavi, A. (2005). Developing and using symbol sense in mathematics. For the Learning of Mathematics, 14(3), 42–47.
[4] Van de Walle, J. A., Karp, K.S., & Bay-Williams, J. M. (2013). Elementary and middle school mathematics. Teaching developmentally. New Jersey: Pearson
[5] Kaput, J. J. (2008). What is algebra? What is algebraic reasoning? In J. J. Kaput, D. W. Carraher, & M. L. Blanton (Eds.), Algebra in the early grades. Reston, VA: NCTM.
[6] Pierce, R., & Stacey, K. (2004). Monitoring Progress in Algebra in a CAS Active Context: Symbol Sense, Algebraic Insight and Algebraic Expectation. International Journal
[7] McArthur, D., Stasz, C., Hotta, J., Peter, O., & Burdorf, C. (1988). Skill-oriented task sequencing in an intelligent tutor for basic algebra. Instructional Science, 17(4), 281-307. for Technology in Mathematics Education, 11(1).
[8] Jamaris, M. (2014). Kesulitan Belajar bagi Anak Usia Dini dan Usia Sekolah.
[9] Bokhove, C., & Drijvers, P. (2010). Digital tools for algebra education: Criteria and evaluation. International Journal of Computers for Mathematical Learning, 15(1), 45-62.
[10] Bokhove, C., & Drijvers, P. (2012). Effects of a digital intervention on the development of algebraic expertise. Computers & Education, 58(1), 197-208.
[11] Warsita, Bambang. (2008). Teknologi Pembelajaran Landasan dan Aplikasinya. Cetakan ke-1. Jakarta: Asdi Maha Satya
[12] Munadi, Yudhi. (2013). Media Pembelajaran; Sebuah Pendekatan Baru. Jakarta:Referensi
[13] Murni, Sylviana. (2008). Pemanfaatan ICT Dalam Pendidikan. Jakarta: Makalah Seminar Nasional The Power Of ICT in Education, PPS UNJ, 15 April 2008
[14] Cobine, G. R. (1997). Studying with the Computer. ERIC Digest.
[15] Patria, Lintang & Kristianus Yulianto. (2010). Pemanfaatan Facebook Untuk Menunjang Kegiatan Belajar Mengajar Online Secara Mandiri. Makalah tidak Diterbitkan
[16] Baird, D. E., & Fisher, M. (2005). Neomillennial user experience design strategies: Utilizing social networking media to support "always on" learning styles. *Journal of educational technology systems*, *34*(1), 5-32.
[17] Chaidar. (2014). Pemanfaatan Teknologi Informasi dan Komunikasi dalam Pembelajaran di SMA Muhammadiyah Taraka. *Kebijakan dan Pengembangan Pendidikan*.
[18] Nookhong, J., & Wannapiroon, P. (2015). Development of collaborative learning using case-based learning via cloud technology and social media for enhancing problem-solving skills and ICT literacy within undergraduate students. *Procedia-Social and Behavioral Sciences*, *174*, 2096-2101.
[19] Blankenship, M. (2011). How social media can and should impact higher education. *Education Digest*, *76*(7), 39-42.
[20] Maharani, M., Supriadi, N., & Widiyastuti, R. (2018). Media Pembelajaran Matematika Berbasis Kartun untuk Menurunkan Kecemasan Siswa. *Desimal: Jurnal Matematika*, *1*(1), 101-106.