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Quality Standards of Online Resources in School Mathematics

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Information Communication Technology (ICT) directly influences the development of teaching and learning processes since they promote innovative pedagogical actions and generate new learning spaces. It helps a self directed learning environment for the teachers and students at any time at any place. Through the internet, online resources provide the facilities of changing the culture of learning without teachers and educational institutions. Evaluating, categorizing and selecting quality standard online resources are necessary for the students of school level for mathematics. Thirty online resources were chosen as a sample, evaluating criteria were developed and assessed through the defined ranking. The result revealed that about 36.67% resources were below the average level and rejected for use in school level mathematics of Nepal based on curriculum, digital technological status, and pedagogical perspective.

Keywords: Digital tools; online resources; technological status; pedagogical quality; didactic quality; content status.

1. INTRODUCTION

Every student learns in their own way. They have different learning styles. The traditional model of learning era has passed away and students in this era do not only rely on hardware materials. To meet the changing needs and expectations, they have many alternatives of learning mathematics. Multi-model content is realized to improve mathematics learning, breaking downlearning barriers, providing all students multiple ways to shine, and engaging students in

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higher level thinking. As a result, developed countries have been using multiple curriculum materials and hardware and digital form. This made to force of generating digital libraries. Digital libraries face new challenges to store standard quality educational resources in printed form. Information seekers are no longer satisfied with only printed materials. They want to supplement the printed books, journals with more dynamic electronic resources such as videos, audios etc. In this way, the demands for online resources in education sector are increasing [1].

There are enormous digital tools like website, online materials, videos, applications and software. Since some years, Nepali mathematics teachers and students also have been using these tools in practice. Covid-19 made compulsion to use these resources to all students and teachers. Before three months on the circular to schools (May, 2020), The Education Ministry of Nepal announced to use some prescribed online resources and software for continuing education. Besides them, a lot of digital resources can be seen in different websites. These Web sites offers educational possibilities including: simplified creation, distribution and maintenance of educational materials; student centered learning; multiple channels for educational participation; content reinforcement; easy access to current information; and multimedia presentation of content [2]. Most of the websites are developed by foreign countries. These resources may or may not have evaluated their quality by the researchers. Mathematics curriculum differs country to country. The main objective of digital resources developer countries is to sell their products as far as possible to worldwide students, teachers and parents although, most of the digital resources are strong in content areas but the contents also are different country to country. All online resources in digital library may not have quality standard for educational purpose. It was found that online resources created by professional organizations such as the Learning Federation (www. thelearningfederation.edu.au), Cambridge University (www.nrich,math.org), the National Council of teachers of Mathematics (illuminations.nctm.org/imath), York University (http://www.counton.org) or the shodor Foundation (www.shodor.org) have a better instructional design than those created by individuals. These online resources are more interactive, pedagogical oriented, sorted by grade level and curriculum objectives, thereby constituting a better search strategy for practicing teachers [3]. But the resources by individual developer are some times debate free. However, internet-based educational resources are making their way into the school mathematics curriculum [4]. Online resources are potentially useful compared to normal courseware because of their abundance, availability at no cost, platform-free accessibility, and their wide reaching accessibility [3]. On the other hand, a major limitation of online resources is their lack of appropriate pedagogy, coupled with poor instructional design and layout. According to Alessi and Trollip (2001, p. 392). To enhance the cognition of students in mathematics, it is necessary to evaluate the different dimensions of online resources. The use of ICT tools in teaching and learning of mathematics has long been studied. However most of the studies were conformed to developed countries like USA, Britain, Australia, Canada etc. In Nepal, a very few researches are conducted on useful online resources for secondary level mathematics but they have not evaluated digital resources. So, I felt a research gap in this sector. Studying different literature related to evaluation of digital resources, I took in mind of different authors [5,3,6,7,8,9,10] contribution on evaluating digital resources at hand. Besides them, on the way, I studied the literature of identifying the components of evaluation by Bortolossi. Bortolossi [11] observes that factors such as the nature of the mathematical content, pedagogical design, graphic design, and interface design are fundamental aspects in the production of educational applications. Bortolossi recommends a combination of the best features of several ICT applications to enable, in a rapid-development environment, the creation of low-cost (but richly designed) portable, dynamic, and interactive with a potential for multiple didactic activities. To Fullan and Donnelly (2013), it is essential to also evaluate the "underlying digital product model design" (pp. 40) along the lines of ease to use, intuitive design, how data are managed, and what experiences it offers the end users. It is very relevant to search some useful digital resources for school level mathematics and categorize, examine quality, and list them.

1.1 Research Questions

The following two were the research questions for this study:

- What are the online resources of mathematics teaching for secondary level mathematics in Nepal?
- What are the qualities of online resources from the technological and pedagogical perspectives?

2. METHODOLOGY

The research design of this research is explorative qualitative design in document analysis. The researcher at first collected and observed mathematics curriculum of Nepal for 6-10th grade and developed two tools for evaluating online resources. I developed first tool having three parts as General Information (8), Grade Level (5) and Content Domain (7) with total score 20. In general information, I observed 5 issues as: Accessible issue, login issue, response issue, nature of content issue and developer country issue. In grade level, I observed the content that was useful for the Nepali students of grade 6-10 according to Nepal's mathematics curriculum. Similarly, I observed 7 units that are contained in mathematics curriculum of Nepal for 6-10 grader students, they are: sets, arithmetic, algebra, mensuration, geometry, trigonometry and at last statistics and probability. The researcher searched mathematics related online resources on laptop, iPhone 7+ and Samsung mobile through searching engine Google by typing digital resources, online resources, mathematics-related online resources, basic level mathematics online resources, secondary level online mathematics resources. I discarded recreational apps in the name of online mathematics resources and searched those online resources suitable for the children equivalent to more than 11 years. These resources were selected from Google play store and were in practice by the mathematics teachers of Butwal. After getting thirty online mathematics resources to evaluate the technological status and pedagogical status, I left to search others since it was not possible to search and evaluate a large hip of digital tools for mathematics teaching. I filled up the chart manually in self-prepared paper by evaluating the technical status of resources (general information), grade level and content domain by the scoring criteria given in Appendix i. After rating the online resources using above tool, I selected those resources which have secured above 41%. Those selected resources were kept under the evaluating criteria of Mhouti (2013) which is given in another table in Appendix ii. Mhouti [6] proposed an approach to identify the main aspects and evaluation criteria of digital resources and describes separately in its own context: The academic, pedagogical, didactic and technical aspect. He designed an evaluation instrument in the form of a computer application. Both the technical and social issues are addressed in this model to evaluate digital learning resources. This instrument is appropriate to select quality digital resources for this study. By the second Mhouti tool's obtained score, 41% above score of resources were selected and others were rejected. There are total 20 questions under the four qualities; academic, pedagogic, didactic and technological. They are ranked in 5 point Likert scale. Academic quality contain 10 full marks, pedagogical quality contain 65 full marks, didactic quality contain 10 full marks and technological quality contain 15 full marks out of 100 full marks. The selected online resources are listed under the evaluation group by second tool. After rating the tools second time, the filtered online resources were prescribed for using mathematics teaching and learning for Nepali mathematics curriculum to 6-10th grades.

3. RESULTS

By using these tools, scores are given according to the defined criteria. Table 1 shows the score of the status of online resources in three domains.

The status of digital tools is determined according as follows:

There are three domains in “Status of Digital Resources”; they are general issues, grade level and content domain. I made a plan of rejecting digital resources if the digital resources have less than 41% in each domain. This rating is appropriate to make uniformity of selecting digital resources between the first and second tool. In this way the yellow highlighted digital tools can not be accepted because they do not meet the defined criteria. Among 30 online resources khullakitab.com ranked below 41% in grade level, coolmath.com is below 41% in content domain, Aimmath.com is below 41% in general information and grade level, Mathmamoth.com is also below 41% in grade level and content domain. Similarly, Mr Robb's Math is below 41% in content domain. So they are rejected. Thus 5 digital tools are rejected from the first tool. There are only 25 digital tools that are recommended for the evaluation of digital resources through second tool.

Table 1. Score of the status of online resources in three domains

		General information (i)					Grade level (ii)					Content domain (iii)										
S.N.	**Link**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**f**	**F**	**Total**	**(i)**	**(ii)**	**(iii)**
1	Digital Interactive Video Education (O)	0	1	1	3	1	1	1	1	1	1	0	1	1	1	1	1	1	17	6	5	6
2	Mathspace(O)	1	0	1	3	1	1	1	1	0	0	1	1	1	1	1	1	1	16	6	3	7
3	Delta Math.com (O)	1	0	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	14	4	3	7
4	Math aids.com (O)	1	0	1	1	1	1	1	0	0	0	1	1	1	0	1	0	1	11	4	2	5
5	VirtualNerd .com(O)	1	1	1	3	1	1	1	1	1	1	0	1	1	0	1	0	1	16	7	5	4
6	Mathalicious (O)	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	1	13	4	5	4
7	Math Mashup (O)	1	1	1	3	1	1	1	1	1	1	0	1	1	1	1	0	1	17	7	5	5
8	Mathsaurus.com	1	1	1	3	1	1	1	1	0	0	1	1	1	0	1	1	1	16	7	3	5
9	Khullakitab.com (o)	1	0	1	1	2	0	0	0	1	1	1	1	1	1	1	1	1	13	5	2*	6
10	Mathssisfun.com (O)	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	4	5	7
11	Master Math.com (o)	1	0	1	3	1	1	1	1	0	0	0	1	1	1	1	0	1	14	6	3	5
12	Kopykitab.com (o)	1	0	1	3	1	0	1	1	1	1	0	1	1	0	1	0	1	14	6	4	4
13	Cuemath.com (o)	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	14	4	5	5
14	Free Math Help.com (o)	1	0	1	2	1	1	1	1	1	1	0	0	1	0	1	1	1	14	5	5	4
15	Explore.com (o)	1	0	1	3	1	1	1	1	1	1	0	1	1	1	1	0	1	16	6	5	5
16	Exam fear.com (o)	1	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	14	4	5	5
17	Coolmath.com (o)	1	0	1	3	1	1	1	1	1	1	0	1	1	0	0	0	0	13	6	5	2*
18	Aaamath.com(O)	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	0	1	12	5	3	4
19	Aimmath.com(o)	0	0	1	1	1	1	1	0	0	0	0	1	1	0	1	0	2	10	3*	2*	5
20	Neok12 (o)	1	0	1	3	1	1	1	1	1	1	0	1	1	0	1	1	1	16	6	5	5
21	Mathplanet.com (o)	1	0	1	2	1	1	1	1	1	1	0	0	1	0	1	1	1	14	5	5	4
22	Math2.org (o)	1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	14	4	5	5
23	Mathmamoth.com (o)	1	1	1	3	1	1	1	0	0	0	0	1	0	0	1	0	0	11	7	2*	2*
24	Khan Academy (o)	1	1	1	3	1	1	1	1	1	1	0	1	1	0	1	1	1	17	7	5	5
25	Yaymath.com (o)	1	1	1	3	1	0	0	1	1	1	0	0	1	0	1	1	1	14	7	3	4
26	Wowmath.com (o)	0	1	1	3	1	1	1	1	0	0	0	1	1	1	1	0	0	13	6	3	4
27	Numberphile.com (o)	1	1	1	3	1	1	1	1	1	1	0	0	0	1	1	0	1	15	7	5	3
28	Tecmath.com (o)	1	1	1	3	1	1	1	1	1	1	0	1	1	0	1	1	1	17	7	5	5
29	Math Forum (o)	1	0	1	3	1	1	1	1	1	1	0	0	1	0	1	1	0	14	6	5	3
30	MrRobb's Math(O)	1	0	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	10	4	5	1*

Table 2. Evaluation of digital tools by ranking 5point likert scale

Nameof Links	Academic quality (10)		Pedagogic quality (65)													Didactic quality (10)		Technological Quality (15)			
Digital Interactive Video Education (O)	5	4	5	5	5	4	5	5	5	5	4	5	5	3	4	4	4	5	3	3	88
Mathspace(O)	5	4	5	3	3	2	5	3	4	1	5	4	3	1	5	2	3	4	1	2	65
Delta Math.com (O)	5	4	4	3	3	4	4	3	4	3	5	4	3	2	3	3	4	4	3	3	71
Math aids.com (O)	5	4	4	1	2	3	4	3	3	3	3	5	3	2	2	2	3	4	3	3	62
VirtualNerd .com(O)	5	4	5	3	2	3	4	3	3	2	3	4	2	2	4	3	3	4	4	4	67
Mathalicious (O)	4	5	3	3	4	3	4	4	3	3	3	3	3	3	2	4	4	4	3	3	68
Math Mashup (O)	5	4	5	4	3	3	4	4	4	5	4	4	3	3	5	4	4	5	4	3	82
Mathsaurus.com	5	5	4	3	3	3	4	3	4	3	3	4	3	3	3	3	4	4	4	4	72
Mathssisfun.com (O)	4	4	4	3	3	4	3	4	4	4	4	3	3	3	3	2	3	3	2	2	65
Master Math.com (o)	5	4	4	3	4	4	4	4	4	4	4	3	4	4	3	3	4	4	4	3	76
Kopykitab.com (o)	3	2	3	2	2	1	3	3	2	2	3	2	2	0	2	2	2	2	1	1	40
Cuemath.com (o)	5	5	5	4	3	4	4	5	4	4	4	4	4	4	4	3	4	4	3	3	80
Free Math Help.com (o)	4	4	4	3	3	2	4	4	2	3	3	4	1	0	3	3	3	2	1	1	54
Explore.com (o)	4	4	5	5	4	4	4	4	4	4	4	4	3	4	3	3	3	3	3	3	72
Exam fear.com (o)	4	4	4	4	4	4	4	4	4	3	4	4	4	3	3	2	3	3	3	3	71
Aaamath.com(O)	4	3	4	3	2	3	4	3	3	3	3	3	2	2	3	3	3	3	3	3	60
Neok12 (o)	5	5	4	4	4	4	4	3	4	3	4	4	3	2	4	3	4	4	4	4	76
Mathplanet.com (o)	4	4	3	3	3	3	4	4	4	4	4	4	2	3	4	3	3	4	3	3	69
Math2.org (o)	4	3	4	2	2	2	3	4	3	3	3	3	3	3	1	3	2	3	1	1	53
Khan Academy (o)	5	5	5	4	4	4	4	4	4	4	4	4	3	3	4	4	4	4	4	4	81
Yaymath.com (o)	4	4	4	3	1	3	3	2	3	3	3	3	2	3	3	3	3	2	2	1	55
Wowmath.com (o)	5	5	3	3	4	3	3	3	3	4	4	4	2	3	3	4	3	2	2	2	65
Numberphile.com (o)	4	4	4	3	2	3	3	3	3	3	3	2	2	2	3	2	3	3	2	2	56
Tecmath.com (o)	4	3	3	3	2	2	3	3	3	2	3	2	2	2	3	3	3	3	3	3	55
Math Forum (o)	5	4	4	3	4	4	4	4	4	4	3	4	2	3	3	3	4	4	4	4	74

After rating the online resources, I rejected the poor resources. Then I used the second tool used by Mhouti [6] to evaluate the quality of digital resources.

Mhouti, Abderrahim, & Azeddine, [6] in their research on the topic "An evaluation model of digital educational resources", they made an evaluation criteria of evaluating digital resources. They are easy to understand and can apply in analysis to measure the quality standard. They are: academic quality, pedagogical quality, didactic quality and technological quality.

For the evaluation of digital resources, 25 out of 30 are ranked according to the Mhouti [6] evaluation criteria. There are total 20 questions under the four qualities; academic, pedagogic, didactic and technological. They are ranked in 5 point Likert scale. Academic quality contain 10 full marks, pedagogical quality contain 65 full marks, didactic quality contain 10 full marks and technological quality contain 15 full marks out of 100 full marks. The selected online resources are listed under the evaluation group by second tool.

The highlighted digital tools are under average level. Kopykitab.com is below 41% in all four qualities, Free Math Help.com is below 41% in technological quality, Aamath.com is below 41% in didactic quality, Math2.org is 41% below in technological quality, Yaymath.com is also below 41% in technological quality. So, I cannot accept these resources. They are rejected because they are not in acceptable category; means they are between 0-40% only. They do not meet all qualities. Now I rejected other 6 digital tools from the evaluation of quality standard chart. So I have only 19 digital tools for ranking out of 25.

By summing up the four dimensions separately, Table 4 gives the result.

Global results of quality evaluation: Mhouti advises the global quality evaluation method of selecting quality digital resources by adding four qualities. According to him, in this evaluation process, I adopted a rating method following Likert scale developed by Mhouti and tested by him and in 2013. The rating intervals show, for each average found, the quality level of the evaluated product:

- 81 to 100: The product is an excellent educational resource. It offers different functionalities and meets the required quality criteria;
- 61 to 80: The product includes some interesting elements despite some weaknesses;
- 41 to 60: The product category is average. It does not allow a sufficiently significant educational use;
- 0 to 40: The product is below the average. It does not meet several required (educational, scientific, technical) quality criteria.

Table 5 indicates the ranking of digital resources in Honor.

Table 6 indicates the ranking of digital tools in Good.

Table 7 indicates the ranking of digital tools in Average.

From the Table 7, we can see that among the sampled online resources only 6.66% are in excellent category, 6.66% are in average level and 50% resources are good. On the other hand 36.67% resources are below average quality according to the measurement tools of this research.

4. DISCUSSION

Evaluating the quality of online resources is a difficult task. Researchers have been proposed different types of criteria to be considered for the evaluation of instructional digital resources. Since, there is a diversity of online resource formats, namely: drills, tutorials, games, simulations, hypermedia based materials and tools and open-ended learning environments [4]. Among the features of a good instructional software, articles, dominantly, speaks of motivation, user control, Internet access, timely and efficient feedback, pedagogical adequacy, interactivity and instructional content [12,13,14,15,16,17,18]. Similarly, evaluating criteria proposed by Hennefin and Pack [12] are; introduction, displays, motivation, navigation aids, questions, self-evaluation, content structure, directions, learning metaphor, methodologies, format of feedback, user control, language style and grammar, and help. Kazmierczak [19] proposed the evaluation criteria for digital resources as ease of use and instructions, technological issues, compatibility issues, accessibility issues and age-related issues of the students by

whom these resources use. Alessi and Trollip [20] proposed as subject matter, auxiliary information, affective considerations, interface navigation, pedagogy, invisible features, robustness, and supplementary materials. To evaluate technological aspects some general information such as login issue, nature of content, accessible issue, response issue are only considered to evaluate technical part of online resources. One of the issue is added in this tool that is developer issue because there is very rare practice of developing online resources in Nepal. To encourage the developers of online resources of Nepal, this issue is added. To evaluate online resources, very simple and understandable Mhouti tool is used in this research. Addressing technological and social aspects of mathematics related digital tools, this model is appropriate for teachers.

Although there are a lot of online resources for the instruction of mathematics in secondary level, only 63.33% resources are acceptable in my sample selection. The above analysis shows that some resources do not meet the requirements of four qualities. According to the analysis, some reformation is necessary in status of online resources and four qualities according to Mhouti which are given star (*). This model is also useful as alternative to evaluate online resources.

Table 3. The total score was arranged from the above table on four qualities according to Mhouti

Name of Links	Score of academic quality (10)	Score of pedagogic quality (65)	Score of didactic quality (10)	Score of technological quality (15)
Digital Interactive Video Education (O)	9	60	8	11
Mathspace(O)	9	44	7	7
Delta Math.com (O)	9	45	5	10
Math aids.com (O)	9	38	6	10
VirtualNerd .com(O)	9	40	8	12
Mathalicious (O)	9	41	8	10
Math Mashup (O)	9	51	8	12
Mathsaurus.com	10	43	7	12
Mathssisfun.com (O)	8	45	5	7
Master Math.com (o)	9	49	7	11
Kopykitab.com (o)	5 *	27*	4*	4*
Cuemath.com (o)	10	53	7	10
Free Math Help.com (o)	8	36	6	4*
Explore.com (o)	8	52	6	9
Exam fear.com (o)	8	49	5	9
Aaamath.com(O)	5	38	4*	7
Neok12 (o)	10	47	7	12
Mathplanet.com (o)	8	45	6	10
Math2.org (o)	7	36	5	5*
sKhan Academy (o)	10	51	8	12
Yaymath.com (o)	8	36	6	6*
Wowmath.com (o)	10	42	7	6*
Numberphile.com (o)	8	36	5	7
Tecmath.com (o)	7	33	6	9
Math Forum (o)	9	46	6	12

Table 4. Summing up the four dimensions separately

	Name of Links	Score of academic quality (10)	Score of pedagogic quality (65)	Score of didactic quality (10)	Score of technological quality (15)	Total
1	Digital Interactive Video Education (O)	9	60	8	11	88
2	Mathspace(O)	9	44	7	7	67
3	Delta Math.com (O)	9	45	5	10	69
4	Math aids.com (O)	9	38	6	10	63
5	VirtualNerd .com(O)	9	40	8	12	69
6	Mathalicious (O)	9	41	8	10	68
7	Math Mashup (O)	9	51	8	12	80
8	Mathsaurus.com	10	43	7	12	72
9	Mathssisfun.com (O)	8	45	5	7	65
10	Master Math.com (o)	9	49	7	11	76
11	Cuemath.com (o)	10	53	7	10	80
12	Explore.com (o)	8	52	6	9	75
13	Exam fear.com (o)	8	49	5	9	71
14	Neok12 (o)	10	47	7	12	76
15	Mathplanet.com (o)	8	45	6	10	69
16	Khan Academy (o)	10	51	8	12	81
17	Numberphile.com (o)	8	36	5	7	56
18	Tecmath.com (o)	7	33	6	9	55
19	Math Forum (o)	9	46	6	12	73

Table 5. Ranking of digital resources in honor

Serial Number	Links categorized as Honor between the score (81-100)
1	Digital interactive video education
2	Khan academy

Table 6. Ranking of digital tools in good

Serial Number	Links categorized as Good between the score(61-80)
1	Mathspace(O)
2	Delta Math.com (O)
3	Math aids.com (O)
4	VirtualNerd .com(O)
5	Mathalicious (O)
6	Math Mashup (O)
7	Mathsaurus.com
8	Mathssisfun.com (O)
9	Master Math.com (o)
10	Cuemath.com (o)
11	Explore.com (o)
12	Exam fear.com (o)
13	Neok12 (o)
14	Mathplanet.com (o)
15	Math Forum (o)

Table 7. Ranking of digital tools in average

1	Numberphile.com (o)	8	36	5	7	56
2	Tecmath.com (o)	7	33	6	9	55

5. CONCLUSION

The development of information and communication technology is being realized giving more emphasis for education at the time of pandemic. The issue of developing ICT infrastructure in underdeveloped and developing countries has been under discussion and governments have a public pressure of performing the task. Developed countries have been starting online education as an alternative way. Some countries are using digital tools for assessments. But underdeveloped and developing countries still have a confusion of what to take a step of continuing education for children since they have no internet access to all the parts of the country. So, internet access is being vital for continuing education in all countries. Using internet, we can use digital resources such as applications, software, videos, websites. Among them online resources like videos, websites related to mathematics are very useful to students and teachers in emergency period. All resources are not quality standard. In mathematics too, a pile of online resources can be seen through internet sources but they are not evaluated through a proper tool according to different dimensions. Although some digital resources are recommended by the government of Nepal subject wise but mathematics related online resources are not recommended. Before recommending, it is necessary to evaluate resources which are useful for students. Moreover, at the time like this emergency period, for continuing education, policy makers and experts have a great responsibility to perform such types of task.

DISCLAIMER

The company name used for this research is commonly and predominantly selected in our area of research and country. There is absolutely no conflict of interest between the authors and company because we do not intend to use this company as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, participant's written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Clulow V, Brace-Govan Jan. Web-based learning: experience-based research; 2003.
2. Raj Kumar R, Hema G. ICT web tools of teaching and learning Mathematics. Quality Higher Education: Digital Era, Southern Level Seminar Proceeding; 2016.
3. Handal B, Handal P, Herrington AJ. Evaluating online mathematics resources: A practical approach for teachers. 2006;8-14.
   Available:https://ro.uow.edu.au/edupapers/573
4. Handal B, Herrington. Re-examining categories of computer-based learning in mathematics education. Contemporary Issues in Technology and Teacher Education; 2003.
   (Retrieved 10 July 2004)
   Available:http://www.citejournal.org/vol3/iss3/mathematics/article1.cfm
5. Nisanci M. Instructional software evaluation criteria used by the teachers: Implications from theory to practice. In D. Willis J, Price J. Willis (Eds.), Proceedings of SITE 2000--Society for Information Technology & Teacher Education International Conference. Waynesville, NC USA: Association for the Advancement of Computing in Education (AACE). 1548-1552; 2000.
   (Retrieved September 8, 2020)
   Available:https://www.learntechlib.org/primary/p/15865/
6. Mhouti EI, Azeddine A, Erradi M. Development of a tool for quality assessment of digital learning resources. International Journal of Computer Applications. 2013;64:27-31.
   DOI: 10.5120/10703-5613
7. Johnson AM, Jacovina ME, Russell DE, Soto CM. Challenges and solutions when using technologies in the classroom. In Crossley SA, McNamara DS, (Eds.) Adaptive Educational Technologies for Literacy Instruction. New York: Taylor & Francis. Published with Acknowledgment of Federal Support. 2016;13-29.

8. Lee C, Cherner T. A comprehensive evaluation rubric for assessing instructional apps. Journal of Information Technology Education. 2015;14:21-53.
9. Anibal Z, Ramón AV, Diana RP. Evaluation of using mathematics educational software for the learning of first-year primary school students. Education Sciences. 2017;7:79. DOI: 10.3390/educsci7040079
10. Escudeiro Paula, Bidarra José. X-TEC: Techno didactical extension for instruction/learning based on computer – A new development model for educational software. Setúbal, Portugal, WEBIST; 2017.
11. Bortolossi HJ. Developing free computer-based learning objects for high school mathematics: Examples, issues and directions. 12th International Congress on Mathematical Education. Fluminense Federal University; 2012.
12. Hannafin MJ, Peck KL. The design development and evaluation of instructional software. Macmillan. Publishing Company, New York; 1988.
13. Alessi S, Trollip S. Computer-based instruction: Method and development. New Jersey: Prentice Hall; 1991.
14. Comer PG, Geissler C. A methodology for software evaluation. In McNeil S, Price J, Boger-Mehall S, Robin B, Willis J, (Eds.). Proceedings of SITE 1998--Society for Information Technology & Teacher Education International Conference. 1998;456-460.
15. Baumgartner P, Payr S. Learning as action: A social science approach to the evaluation of interactive media. In: Educational Multimedia and Hypermedia, Proceedings of ED-MEDIA 96, Ed. P. Carlson and F. Makedon. Boston: AACE; 1996.
16. Persichitte KA. Teaching ABOUT distance education WITH distance education. In Robin B, Price JD, Willis J, Willis DA, (Eds.). Technology and teacher education annual. Charlottesville, VA: Association for the Advancement of Computing in Education. 1996;742743.
17. Caftori N, Paprzyc.ki M. The design, evaluation and use of educational software. Technology and Teacher Education Annual. AACE: Charlottesville, VA; 1997.
18. Abramson A. Monitoring and evaluating use of the World Wide Web in an academic library. Information Access in the Global Information Economy. Proceedings of the 61st Annual Meeting of the American Society for Information Science 35, Pittsburgh, PA, October 25-29. Medford, NJ: Information Today, Inc.1998;315-326.
19. Kazmierczak L. Technology evaluation criteria for apps and websites for education. Early Childhood Special Education and Assistive Technology Blog; 2017.
20. Alessi S, Trollip S. Multimedia for learning: Methods and development (3rd Ed.), (pp. 410). Boston: Allyn & Bacon; 2001.

APPENDIX i

1.General information (8)

Link	Accessible issue	Login issue	Response issue	Nature of content (Audio, video, text)	Developer

Accessible issue (1): 1-free, 0-not free
Login issue (1): 1-no provision of login, 0-proivision of login
Response Issue (1): 1- response within 5 days(good), 0- no response (poor)
Nature of content (3): 1-Audio, 1-video, 1-text
Developer (2): 2-Nepal, 1-other country

2.Grade level(5)

Name	Class				
	6	7	8	9	10

If the resource is useful for 6-10 grades, it will get 5 score.

3. Content domain (7)

Name	Content domain						
	SET	Arithmetic	Mensuration	Algebra	Geometry	Trigonometry	Stats. & Probability

If the resource is useful to all seven units, it will get 7 score.
Using the above tool for 30 online resources of mathematics, I got their score. I rated these resources according to the following way.
Rating total: General information (8)+ grade level (5)+content domain(7)=20
The rating procedure is given below.
17 to 20: THE product is an excellent educational resource. It offers different functionalities and meets the required status criteria;
13 to 16: The product includes some interesting elements despite some weaknesses;
9 to 12: The product category is average. It does not allow a sufficiently significant educational use for our students;
0 to 8: The product is below the average. It does not meet several required status criteria.

APPENDIX ii

The format recommended by Mhouti is given below.

1. Online resources

Indicators	Online resources									
1.Academic quality (10)										
Information reliability (Is the information presented reliable?)										
Information relevance (Is the information presented relevant?)										
2. Pedagogical quality (Evaluates on the basis of four aspects) (65)										
a. Pedagogical formulation										
Is the quality of resources simplification good?										
Does the educational resource present overviews and summaries?										
b. Pedagogical construction										
Are the objectives to be achieved stated?										
Does the product include stimuli likely to promote learning?										
Are knowledge and existing learners' representations taken into account?										
Is the active mental engagement of the learner favored?										
Is learning based on learner-centeredness?										

Are there any problem-solving tasks fostering a constructive learning?										
Does the tool present activities creating interactions between learners?										
c. Pedagogical strategies										
Does learning allow anticipation of development by taking into account the ZPD4?										
d. Assessment method										
Does the tool provide an assessment procedure?										
3. Didactic quality (10)										
(Learning activities) Do activities refer to real problems which the learner will possibly facing outside the classroom?										
(Learning content) Is there a match between the audience, content and objectives?										
4. Technical quality (15)										
Design: Is browsing between different elements of the product easy?										
Browsing: Are multimedia techniques in favor of information and pedagogy?										
Technological ingenuity: Do multimedia techniques promote information and pedagogy?										
Total score (100)										

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