Estado del Arte de Aprendizaje de Fracciones con MLearning

Jorge Edgar Rojas Magdaleno, Antonio Suárez Zinzun, Roberto Suárez Zinzun *

Instituto Tecnológico de Estudios Superiores de Zamora, Km. 7 Carretera Zamora – La Piedad, Zamora, Michoacán C.P. 59720, México

Abstract

Existen estudios del tema de fracciones donde se destaca la dificultad en el aprendizaje y enseñanza de este tema del área de las matemáticas, debido a que se requiere para el dominio de otros temas como algebra, probabilidad, cálculo, es importante buscar estrategias de enseñanza que contribuyan al aprendizaje significativo de fracciones. El aprendizaje móvil, "m-learning" ofrece métodos modernos de apoyo al proceso de aprendizaje mediante el uso de instrumentos móviles, tales como las computadoras portátiles y las tabletas informáticas, los lectores MP3, los teléfonos inteligentes (*smartphones*) y los teléfonos móviles. El aprendizaje móvil se está convirtiendo en una de las soluciones a los problemas que confronta el sector educativo. Por ello el programa de actividades de la UNESCO se basa en un número, cada vez mayor, de iniciativas conjuntas encaminadas a estudiar de qué manera las tecnologías móviles pueden propiciar la consecución de la Educación para Todos (EPT). El presente artículo muestra los resultados de la investigación sobre el estado del arte del Apredizaje Móvil (M-Learning), en busca de trabajos relacionados con el aprendizaje de fracciones, en el periodo de 2010 a 2016.

Keywords: M-Learning; Aprendizaje móvil; enseñanza-aprendizaje de fracciones.

1. Introducción

Un tema importante en las curriculas de matemáticas es el de fracciones [1], que se aprende a la mitad de los planes de estudio de la asignatura de matemáticas, el entendimiento de este tema es de vital relevancia por ser la base de temas posteriores en matemáticas como el álgebra y probabilidad. Más sin embargo este tema no solo es difícil para el aprendizaje, también lo es para la enseñanza [2][3]. Las fracciones son un reto pedagógico por la dificultad tanto en enseñanza como aprendizaje, esas dificultades se dan en los primeros años de la primaria [4][5] y persisten aún en la secundaria e incluso en la preparatoria [6][7]. Los retos y malentendidos que se enfrentan estudiantes en la comprensión de fracciones [8][9] persisten en la vida adulta y plantean problemas en áreas como medicina, salud, construcción y programación de computadoras. Hoy en día las tendencias en la enseñanza se enfocan en el desarrollo de competencias básicas en el aprendizaje; haciendo uso de los avances tecnológicos como recursos didácticos alternativos para el aprendizaje. En el ámbito educativo, el uso de las Tecnologías de Información y Comunicación (TIC), en específico los dispositivos móviles: teléfonos celulares inteligentes (*smartphones*), asistentes personales digitales (PDA's), tabletas digitales, pizarrones táctiles, etc., pueden apoyarse a la investigación y la docencia para usarse de manera eficiente y razonada, propiciando aprendizaje significativo. En la actualidad, los usos que se les da a los dispositivos móviles es en su mayoría para actividades de entretenimiento; escuchar música, jugar videojuegos, consultar redes sociales [10]. Sin embargo, también se le puede dar un uso académico como apoyo de la enseñanza de diversas asignaturas [11], en particular las matemáticas. El uso de dispositivos móviles en el proceso de enseñanza – aprendizaje representa un nuevo paradigma conocido como aprendizaje móvil (*M-Learning*). La principal característica de *Mobile Learning* o Aprendizaje Móvil es la ubicuidad, que permite el desarrollo de actividades de enseñanza - aprendizaje en cualquier lugar y momento. Existen una cantidad amplia de dispositivos, tal y como se describe en párrafos anteriores, pero en el campo de la educación destacan tres: *smartphones* o teléfonos inteligentes, las tablets o tabletas digitales y los *phablets*, un dispositivo hibrido de los dos anteriores. Para

* Corresponding author. Tel.: 01 351 5200219 Ext. 1119; fax: 01 351 5200219.
E-mail address: iserm@teczamora.mx

muchos, los teléfonos móviles se contraponen al aprendizaje, sus limitaciones de tamaño de pantallas derivan a que se vincula a los teléfonos móviles con el esparcimiento más que con la educación. Muchas personas se oponen al aprendizaje móvil porque presumen que los dispositivos asociados a este tipo de aprendizaje no pueden ofrecer un contenido educativo sólido. Más sin embargo en muchos países y empresas recientemente se ha impulsado la elaboración de recursos digitales y materiales didácticos de alta calidad para dispositivos móviles. En proyectos de gran envergadura en Asia, especialmente en la República de Corea y en Singapur, se procura utilizar la tecnología móvil para hacer la educación más personalizada y colaborativa. Por ejemplo, en la República de Corea se ha lanzado una iniciativa nacional para cambiar los libros de texto en papel a un formato electrónico en 2015. Si bien este ha sido el caso tradicionalmente, en muchos países y empresas recientemente se ha impulsado la elaboración de recursos digitales y materiales didácticos de alta calidad para dispositivos móviles. En proyectos de gran envergadura en Asia, especialmente en la República de Corea y en Singapur, se procura utilizar la tecnología móvil para hacer la educación más personalizada y colaborativa. Por ejemplo, en la República de Corea se ha lanzado una iniciativa nacional para cambiar los libros de texto en papel a un formato electrónico en 2015[12]. Es por ello que derivado de la problemática descrita al principio de esta sección, en relación con las fracciones, se da a la tarea de indagar acerca de trabajos que busquen resolver la problemática, particularmente con el uso de dispositivos móviles, pero no se descarta aprendizaje de fracciones en otras plataformas.

2. Objetivos de la investigación

El presente artículo plantea los siguientes objetivos:

1. Localizar literatura de caracter científico relacionada con el aprendizaje móvil de fracciones.
2. Analizar bibliografía del tema de fracciones con *M-Learning* en el periodo de 2010 a 2016.
3. Identificar los ejes temáticos de la bibliografia analizada.
4. Dar a conocer los resultados del presente artículo.

3. Metodología

En primera instancia se realiza una revisión de caracter descriptiva, de producción científica en relación al tema de Aprendizaje Móvil, en específico con fracciones, el periodo de revision es de 2010 a 2016.

Las Fuentes de consulta son principalmente artículos publicadas en revistas científicas, la primera fuente de consulta son indices de las siguientes bases de datos: *scopus*, *web of science*, *scielo*, IEEE, ACM, *InderScience*, Redalyc, RIED; en segunda instancia se revisa publicciones de algunas revistas y congresos, donde se destacan: *Proceedings of Society for Information Technology & Teacher Education International Conference*, *International Journal of Mobile Learning and Organisation*, *International Journal of Mobile and Blended Learning*, *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, *Journal of Technology Studies*, *Procedia - Social and Behavioral Sciences*, *Eleventh International Conference on Communication Networks*, *3rd World Conference on Educational Technology*, *Proceedings of Global TIME*, *Proceedings of EdMedia: World Conference on Educational Media and Technology*, *American Educational Research Journal*, *International Conference on Mathematics Education Research*, *The International Review of Research in Open and Distributed Learning*, REDIE. Revista Electrónica de Investigación Educativa, *5th World Conference on Educational Sciences*, *7th World Conference on Educational Sciences*, *International Future-Learning Conference on Innovations in Learning for the Future*, ERPA *International Congress on Education*, ERPA, *Association for the Advancement of Computing in Education* (AACE),

En una primera búsqueda, se utiliza el patrón Fracciones y M-Learning, debido a los pocos resultados

obtenidos, se amplian las opciones en la búsqueda, que se basa en palabras clave y abstracts como: Aprendizaje móvil, Mobile Learning, M-Learning, Enseñanza de las Matemáticas, Recursos Móviles. La cantidad de artículos encontrados en relación al proceso de enseñanza – aprendizaje usando *M-Learning* no es tan amplia, por lo tanto se comienza la busqueda sobre temas como Aprendizaje Móvil aplicado nociones matemáticas, otras áreas de las mismas matemáticas como algebra y geometría, y otras áreas distintas a la disciplina anterior. Finalmente se agrega a la lista de artículos a revisar áreas como las que a continuación se mencionan:

- Aprendizaje de Fracciones y nociones matemáticas con M-Learning y en otras plataformas.
- M-Learning, Mobile Learning, Aprendizaje Móvil, uLearning, Aprendizaje Ubicuo y Tecnologías emergentes.
- App, Aplicaciones móviles, realidad aumentada, Lenguajes de desarrollo para móviles, arquitectura de aplicaciones y componentes.
- Apropiación y uso de tecnología y diseño instruccional.
- E-learning y MOOC.
- Dispositivos móviles, teléfono inteligente, smartphone, tablets, phablet, tabletas, iPad.
- Juegos, actividades y gamificación
- Dispositivos móviles, teléfono inteligente, smartphone, tablets, phablet, tabletas, iPad.
- Enseñanza – aprendizaje de nociones matemáticas.

4. Resultados

Se comienza con una muestra inicial de 477 referencias, la cuál se va reduciendo debido a que muchas de las Fuentes eran de años anteriores al 2010 y en algunos casos, posterior a la revision de los resumenes, era de temas que tenían poca relación con el tema de está investigación, el número final de referencias consultadas fue de 237, Las revistas y fuentes de consulta se clasifican como a continuación se muestra (Tabla 1):

TABLA 1. PRODUCCIÓN CIENTÍFICA CONSULTADA EN TORNO AL *MLEARNING* EN REVISTAS.

Revistas y Congresos/Período de Publicación	2010	2011	2012	2013	2014	2015	2016	T
Actualidades Investigativas en Educación						1		1
Apertura		1		1	2			4
British Journal of Educational Technology			1		1			2
Computación y Sistemas		1						1
Computers & Education	1	2	3	1	1	1	9	18
Computers in Human Behavior							3	3
Comunicar	2		1					3

Contemporary Educational Psychology						1		1
Contemporary Issues in Technology and Teacher Education				1				1
Developmental Review						1		1
Distance Education		1						1
Economics of Education Review						1		1
Educación Médica Superior						1		1
Educar					1			1
Education and Information Technologies			1					1
Expert Systems with Applications		1						1
IEEE Revista Iberoamericana de Tecnologías del Aprendizaje – RITA						1		1
IGI Global						1		1
Indivisa. Boletin de Estudios e Investigación					1			1
Informática Económica	1							1
International Journal on Computer Science and Engineering			1					1
International Journal of Educational Development				1				1
International Journal of Educational Research							1	1
International Journal of Mobile and Blended Learning						10	8	18
International Journal of Mobile Learning and Organisation		13	15	12	15	15	8	78
Journal of Information Systems and Technology Management	1	1						2
Journal of Experimental Child Psychology						1		1
Journal of Interactive Learning Research	1	3						4
Journal of Systems and Software		2						2
Journal of Technology Studies	1	1				1		3
Learning Disabilities Research & Practice		1						1
Pixel-Bit. Revista de Medios y Educación		1	1				1	3
Professional Development in Education							1	1
RED. Revista de Educación a Distancia			1	1		1		4
REDIE. Revista Electrónica de Investigación Educativa				1				1

REICIS. Revista Española de Innovación, Calidad e Ingeniería del Software			1					1
RIED. Revista Iberoamericana de Educación a Distancia	2						2	4
RUSC. Universities and Knowledge Society Journal					2			2
TechTrends: Linking Research & Practice to Improve Learning						1		1
Teoría de la Educación. Educación y Cultura en la Sociedad de la Información	1			2	2			5
The International Review of Research in Open and Distributed Learning	1	1						2
Turkish Online Journal of Educational Technology		1						1
Total	11	30	25	20	25	37	33	182

En relación a los eventos científicos (congresos) que tienen relación con *M-Learning*, *Mobile Learning*, Aprendizaje Móvil y Fracciones en *M-Learning* se tienen los siguientes resultados (Tabla 2):

TABLA 2. PRODUCCIÓN CIENTÍFICA EN TORNO AL *MLEARNING* EN EVENTOS CIENTÍFICOS (2010-2016).

Revistas y Congresos/Período de Publicación	2010	2011	2012	2013	2014	2015	2016	T
CIATA						2		2
Encuentro Nacional de Ciencias de la Computación					7			7
IEEE Frontiers in Education Conference (FIE) Proceedings					1			1
International Conference on Mathematics Education Research	1							1
Procedia - Social and Behavioral Sciences	1	3	1	6	3	9		23
Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education	7							7
Proceedings of EdMedia: World Conference on Educational Media and Technology	2	1	2	1				6
Proceedings of Global Learn	1							1
Proceedings of Global TIME			1					1
Society for Information Technology & Teacher Education International Conference	1		2	2				5

Total	13	4	6	9	11	11	0	54

La siguiente gráfica muestra la comparación de la producción en revistas y congresos, de los temas previamente mencionados, (Fig. 1).

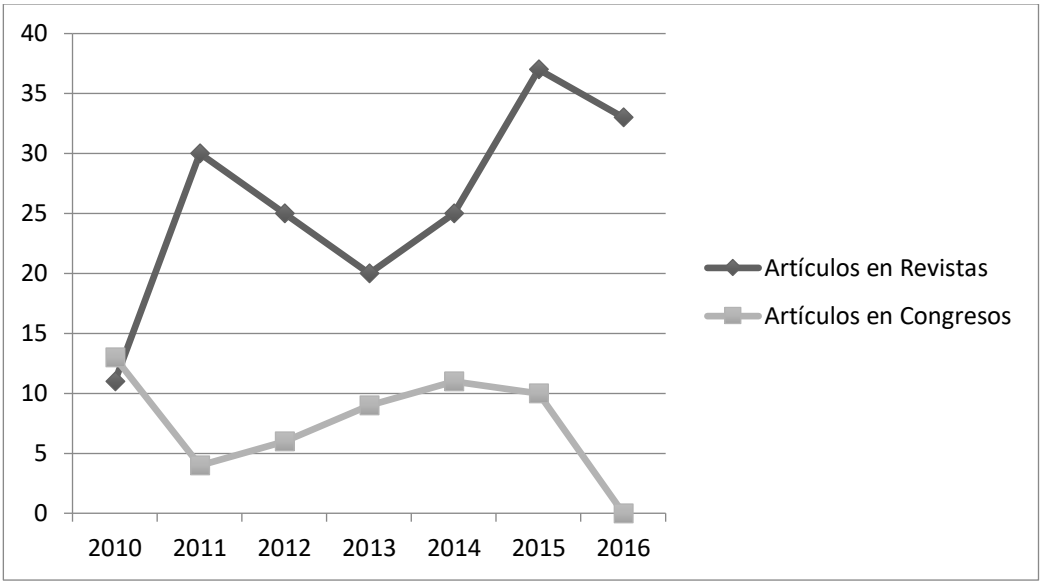

Fig. 1. Documentos científicos consultados en revistas científicas y eventos de los años 2010 a 2016

La cantidad de artículos por año y por la clasificación de temas, previamente mencionados en la metodología, arroja los siguientes resultados (Tabla 3):

TABLA 3. PRODUCCIÓN CIENTÍFICA POR AÑOS Y TEMAS.

Revistas y Congresos/Período de Publicación	2010	2011	2012	2013	2014	2015	2016	T
Aprendizaje de Fracciones y nociones matemáticas con M-Learning y en otras plataformas	4	6	2	3	3	4	3	25
M-Learning, Mobile Learning, Aprendizaje Móvil, uLearning, Aprendizaje Ubicuo y Tecnologías emergentes	9	12	13	8	10	13	11	76
App, Aplicaciones móviles, realidad aumentada, Lenguajes	2	2	4	3	6	2	4	23

de desarrollo para móviles, arquitectura de aplicaciones y components								
Apropiación y uso de tecnología y diseño instruccional	8	8	9	9	13	17	9	73
E-learning y MOOC						1	1	2
Dispositivos móviles, teléfono inteligente, smartphone, tablets, phablet, tabletas, iPad	1			1			1	3
Juegos, actividades y gamificación		1	2	2	1		2	8
Enseñanza – aprendizaje de nociones matemáticas	3	3		4	4	11	2	27
TOTALES	27	32	30	30	37	48	33	237

Conclusiones

Se puede ver una tendencia clara de trabajos principalmente en las categorías de *M-Learning*, *Mobile Learning*, Aprendizaje Móvil, *uLearning*, Aprendizaje Ubicuo y Tecnologías emergentes y la de Apropiación y uso de tecnología y diseño instruccional.

El estado del *Mobile Learning* para la enseñanza – aprendizaje de fracciones, según los datos de producción consultados es de 25 sobre un total de 237 publicaciones, apenas un 10.5%, esto puede indicar dos posibilidades, la primera que hay una razón por la cuál no se publica sobre actividades en el tema de fracciones y la segunda que es un campo poco explorado, tomando en cuenta el impacto social y la tendencia de crecimiento de uso de dispositivos móviles se puede considerer como escasa la producción científica en el area de

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ANEXO I - Relación de publicaciones científicas sobre temas de M-Learning consultadas (2010-2016)

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