

References

Alomari, A. M. (2009). Investigating online learning environments in a web-based math course in Jordan. (undetermined). *International Journal of Education & Development using Information & Communication Technology*, 5(3), F1-F18.

Abstract: The Ministry of Education of Jordan (Moe) is the first institution introducing an open e-learning platform in the school system of Jordan, and has been deploying the system in 100 experimental (discovery) schools in that region. This study focuses on a web-based learning environment and the integration of uses and gratification approach into the evaluation of the quality of Jordanian tenth grade math students' experiences when interacting with an e-learning platform. This study investigates the learning activities and the relationships created when learners interacting with e-learning platform. This study uses interviews, direct classroom observations and field-notes of classroom practices. The findings suggest that Jordanian students recognized the potential of e-learning platform to support the data gathering for teaching and learning, but they were uncomfortable and unsatisfied with the learning environment provided (e.g., practiced low interactions with the features of the interface created, low student-student relationships, low student-teacher relationships and low student-media interaction). The reflection activities and technology competence for male participants were higher than female participants. The results of this study highlight the importance of integrating uses and gratifications approach into the evaluation of learning process in online learning environments. PUBLICATION

ABSTRACT]

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the impact of online math programs?

PARTICIPANT DESCRIPTION

- * 10th grade students in Jordan
- * 32 male and 29 female students participated
- * Required math class for students

METHOD

- * The study looked at how students interacted with a web-based e-learning platform.
- * This was a qualitative study. They used interviews, direct observations and documents to collect data.
- * They used Web CT, CDs, and other LMS/CMS tools to deliver the content

RESULTS

- * There is not enough info to support the idea that the e-learning platform increases the level of interaction which produces a positive outcome.
- * Males tended to be more comfortable with the technology than females.
- * Students complained about not having enough time to interact with the technology.
- * Students reported that the system didn't allow them to dig deep into the mathematics.

RELATION TO THE AREA OF RESEARCH INTEREST

- * Impact of online math programs on learning and engagement
- * Student and teacher perceptions of online learning tools

Calhoon, M. B., Fuchs, L. S., & Hamlett, C. L. (2000). Effects of computer-based test

accommodations on mathematics performance assessments for secondary students with learning disabilities. *Learning Disability Quarterly*, 23(4), 271-282.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 81 students - grades 9-12
- * students had learning disabilities
- * students were receiving math and reading instruction in special ed resource room

METHOD

- * study compared the effects of computer accommodations to a non computer-based test accommodation on performance
- * repeated measures design - each student completed a math performance assessment under 4 conditions - standard administration, teacher-read, computer-read, computer-read with video
- * students completed a questionnaire about their perception of their performance

RESULTS

- * the teacher-read, computer-read and computer-read with video showed improved performance compared to standard admin
- * no significant difference between teacher-read, computer-read and computer-read with video
- * student perceptions - students didn't have a strong preference between teacher-read, computer-read and computer-read with video

RELATION TO THE AREA OF RESEARCH INTEREST

- * assistive technology - does this help with problem solving and struggling readers?

Freeman, B., & Crawford, L. (2008). Creating a middle school mathematics curriculum for english-language learners. *Remedial & Special Education, 29*(1), 9-19.

Abstract: A study examined the outcomes of the Help with English Language Proficiency (HELP) Math program, an online program to supplement mathematics instruction for middle school students with limited proficiency in English. Participants were 154 middle school students in Colorado. Findings revealed that the HELP program was successful in developing both mathematics knowledge and English proficiency among English language learners. Other findings and implications of the study are discussed.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the impact of online math programs?

PARTICIPANT DESCRIPTION

- * 154 middle school students in the treatment group
- * students came from 3 different school districts in Colorado
- * control group was used (not sure how many people were in the control group)

METHOD

- * 30-item, standards-based test administered to students
- * focus groups and exit surveys were used to gather attitudinal data from students and teachers

RESULTS

- * 73% average improvement from pre to post-test in treatment group compared to 8% in the control group
- * students with advanced English language skills show greatest improvements - 79% increase; 39% improvement for intermediate English language skill students; 54% improvement for nonproficient English language skill students
- * Attitudinal results: very positive feedback from teachers and students

RELATION TO THE AREA OF RESEARCH INTEREST

Impact of online math programs on learning and engagement

Heng Ngee Mok. (2014). Teaching tip: The flipped classroom. *Journal of Information Systems Education*, 25(1), 7-11.

Abstract: The flipped classroom has been gaining popularity in recent years. In theory, flipping the classroom appears sound: passive learning activities such as unidirectional lectures are pushed to outside class hours in the form of videos, and precious class time is spent on active learning activities. Yet the courses for information systems (IS) undergraduates at the university that the author is teaching at are still conducted in the

traditional lecture-in-class, homework-after-class style. In order to increase students' engagement with the course content and to improve their experience with the course, the author implemented a trial of the flipped classroom model for a programming course with pair programming as the predominant in-class active learning activity. Student feedback on this pedagogy was generally very positive with many respondents considering it effective and helpful for learning. One of the biggest advantages mentioned by students is that they had the option to watch each video lecture as many times as required to be prepared for class. The author also observed that students were more engaged and empowered to take on more ownership for their learning. He recommends that other instructors consider rolling out their own trials of the flipped classroom incrementally for courses that would benefit the most from this pedagogy.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * undergraduate students
- * I'm not sure how many students participated.

METHOD

- * students in undergraduate course we exposed to a flipped model of classroom instruction
- * students watched videos created by the instruction out of class and did paired programming projects in class
- * observations and interviews were conducted to collect data

RESULTS

- * students had very positive feedback on the flipped model

* increased student engagement was observed

RELATION TO THE AREA OF RESEARCH INTEREST

* Does the flipped model work for online math programs? Will it lead to increased collaborative problem solving opportunities in class?

General Notes:

* I'm interested in the flipped model because I think it might help me as I think about implementation ideas, but this research article is just not very good. I'm not really sure it should be in my bibliography, but I reviewed it so I'm going to leave it for now.

* Overall I didn't think it was a very good study.

Jimison, P. (2011). Effective blended learning environments. *College & University Media Review*, 17, 59-68.

Abstract: This paper describes the characteristics and features of a well-structured blended learning environment. In creating a successful blended learning environment, it is important to seek out the goals of the classroom, then set forth a plan to implement the goals through face-to-face and online learning. This paper reflects such issues as definitions, curriculum planning, and ideas for technology implementation including Khan's Octagonal Framework and the flipped classroom. When teachers set instructional goals and review how the technology can help meet the goals, blended learning can create a successful learning environment.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are some of the current educational practices in using online adaptive math programs?

PARTICIPANT DESCRIPTION

* This article is from a peer reviewed journal, but it isn't based on a research study.

General Notes:

* This is a good article on blended learning. I might use some info from this article as I think about the best approach for implementing online adaptive math programs.

Klinkenberg, S., Straatemeier, M., & Van, D. M. (2011). Computer adaptive practice of maths ability using a new item response model for on the fly ability and difficulty estimation. *Computers & Education, 57*(2), 1813-1824.

Abstract: In this paper we present a model for computerized adaptive practice and monitoring. This model is used in the Maths Garden, a web-based monitoring system, which includes a challenging web environment for children to practice arithmetic. Using a new item response model based on the Elo (1978) rating system and an explicit scoring rule, estimates of the ability of persons and the difficulty of items are updated with every answered item, allowing for on the fly item calibration. In the scoring rule both accuracy and response time are accounted for. Items are sampled with a mean success probability of .75, making the tasks challenging yet not too difficult. In a period of ten months our sample of 3648 children completed over 3.5 million arithmetic problems. The children completed about 33% of these problems outside school hours. Results show better measurement precision, high validity and reliability, high pupil satisfaction, and many interesting options for monitoring progress, diagnosing errors and analyzing development. (PsycINFO Database Record (c) 2012 APA, all rights reserved). (journal abstract)

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the impact of online math programs?

PARTICIPANT DESCRIPTION

- * 3468 children completed 3.5 million arithmetic problems in the Netherlands
- * 35 primary schools, 8 remedial teachers, 32 families
- * grades K-6 primarily

METHOD

- * They used the Maths Garden program for practice and monitoring.
- * Students played the math game. They could select addition, subtraction, multiplication or division. Visual feedback was given to show their progress. The theme was a flower garden.
- * Students played the math game during 2 class periods and then did it at home.
- * They analyzed data on how often and how long students played.

RESULTS

- * Students were motivated to play the game.
- * Low and high ability students played about the same amount.
- * A lot of valuable data was collected and which can be used to monitor progress, diagnose errors, and analyze development.

RELATION TO THE AREA OF RESEARCH INTEREST

- * Use online programs to make data-driven decisions
- * Motivation for students using online programs

General Notes:

- * Maths Garden sounds a lot like Reflex math.
- * The study didn't look at student performance. At least I didn't see that.
 - * This study might be helpful as I make the case for using programs to make data-driven decisions.

Koedinger, K. R., McLaughlin, E. A., & Heffernan, N. T. (2010). A quasi-experimental evaluation of an on-line formative assessment and tutoring system. *Journal of Educational Computing Research*, 43(4), 489-510. doi:10.2190/EC.43.4.d

Abstract: ASSISTments is a web-based math tutor designed to address the need for timely student assessment while simultaneously providing instruction, thereby avoiding lost

instruction time that typically occurs during assessment. This article presents a quasi-experiment that evaluates whether ASSISTments use has an effect on improving middle school students' year-end test scores. The data was collected from 1240 seventh graders in three treatment schools and one comparison school. Post-test (7th grade year-end test) results indicate, after adjusting for the pre-test (6th grade year-end test), that students in the treatment schools significantly outperformed students in the comparison school and the difference was especially present for special education students. A usage analysis reveals that greater student use of ASSISTments is associated with greater learning consistent with the hypothesis that it is useful as a tutoring system. We also found evidence consistent with the hypothesis that teachers adapt their whole class instruction based on overall student performance in ASSISTments. Namely, increased teacher use (i.e., having more students use the system more often) is associated with greater learning among students with little or no use, suggesting that those students may have benefited from teachers adapting their whole-class instruction based on what they learned from ASSISTments use reports. These results indicate potential for using technology to provide students instruction during assessment and to give teachers fast and continuous feedback on student progress. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the impact of online math programs? What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 1240 7th graders
- * 4 middle schools from urban districts in Massachusetts

METHOD

- * quasi-experiment study was done — no random assignment of students (or classes or schools) to condition
- * conducted throughout an entire school year

RESULTS

- * 7th grade students showed a significant gain in standardized test scores
- * When students in the same school used the online tool more than other students, they had a bigger improvement in scores.

RELATION TO THE AREA OF RESEARCH INTEREST

- * Use online programs to make data-driven decisions
- * Motivation for students using online programs

General Notes:

- * ASSISTments program - web-based math tutoring program - designed to provide ongoing assessments while simultaneously providing instruction
- * This tool provides instructional help during the test. Maybe good for math anxiety.
- * This reminds me a lot of KnowRe's approach to instructional support.

Kronholz, J. (2012). Can Khan move the bell curve to the right? Math instruction goes viral.

Education Next, 12, 16+.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

Do online adaptive math programs improve student performance?

PARTICIPANT DESCRIPTION

- * 5th graders and 7th graders in California.
- * 135 total students in the study.

METHOD

- * This was not a formal study.
- * They looked at standardized test scores, conducted interviews, and did observations to collect data.

RESULTS

- * 7th graders improved on state standardized tests when comparing data from previous year. (41% proficient/advanced from 23% the year before)
- * 5th graders improved as well (96% proficient/advanced compared to 91% the year before)

RELATION TO THE AREA OF RESEARCH INTEREST

- * Data to support the fact that online programs improve student performance. However, not a formal study so I'm not sure I can use this data to support my research.

General Notes:

- * Great article on the history of Khan Academy.
- * I like how the article talks about the blended approach to using Khan — in-class instruction, practice on Khan, teachers uses data to make decisions and assign tasks.
- * The article talked about the importance of teaching teachers that learning how to implement something like this is important.

Li, Q., Moorman, L., & Dyjur, P. (2010). Inquiry-based learning and e-mentoring via videoconference: A study of mathematics and science learning of Canadian rural students. *Educational Technology Research & Development*, 58(6), 729-753. doi:10.1007/s11423-010-9156-3

Abstract: This research seeks to (1) establish a feasible development and implementation model for an inquiry-based learning environment with e-mentoring using videoconference, and (2) apply the model to examine its impact on rural students' learning. To achieve these goals, we developed a model of inquiry-based learning with e-mentoring (IBLE) based on CII's inquiry model (Community Informatics Initiative 2009; <http://inquiry.uiuc.edu/>). We then tested the effectiveness of the IBLE model and reported our work in a rural context.

Results showed that IBLE had enhanced students' learning, most significantly on their affective development, including increased motivation, broadened understanding, and augmented career awareness. Implications for design and limitations of the study are also discussed. Database name: Education full text

NAME OF CONTRIBUTOR

Reza Chowdhury

RESEARCH QUESTIONS

- * Establish a feasible development and implementation model for an inquiry-based learning environment with e-mentoring (IBLE)
- * apply the model to improve rural students' learning of math and science in secondary classrooms

PARTICIPANT DESCRIPTION

- * Three grade-eight math classes, taught by the same teacher, in a rural school participated in this study
- * One treatment group of 26 students
- * Two control classes comprised of 41 students (13–14 years-old)

METHOD

- * This study used a mixed method approach for collecting data, focusing on affective (e.g. student beliefs, motivation, awareness) and cognitive outcomes (achievement).
- * Both quantitative and qualitative data were collected at the same time, and later integrated to interpret overall results through statistical and thematic analysis
- * Quantitative data consisted of student paper-based academic tests (teacher-designed) including a pre-assessment (treatment group only) and the final examination (treatment and control groups)
- * Qualitative data consisted of interviews of students, their teacher and e-mentors; detailed field observation notes; teacher's reflective journals; videotaped VC sessions; and student written assignments

RESULTS

- * Quantitative analysis of test scores was conducted to examine the effect of IBLE on students' math achievement. Comparing the final exam grades between treatment and control groups, the independent t-test showed no significant difference between the

treatment group ($M = 97.35$, $SD = 28.55$) and the control group ($M = 85.4$, $SD = 24.54$), $t(65) = 59.03$, $p = .056$

* A paired-sample t-test was conducted on treatment group to examine possible treatment effects. When the pre- and post-tests were analyzed, a significant difference was identified (pretest: $M = 57.76$, posttest: $M = 67.75$), indicating that students' achievement was significantly improved from pretest to the posttest: $t(25) = 3.54$, $p = .002$

* Qualitative data were analyzed to explore how inquiry-based learning with e-mentoring (IBLE) impacted student math and science learning, focusing on affective development. Three salient themes were identified, indicating a resultant effect on the students' confidence and interest in learning the subject matter, the relevancy of science and math, a change in their perspective of the roles of scientists and mathematicians, and awareness of career possibilities

RELATION TO THE AREA OF RESEARCH INTEREST

* Inquiry-based learning for mathematics and science

Light, D., & Pierson, E. (2014). Increasing student engagement in math: The use of Khan Academy in Chilean classrooms. *International Journal of Education & Development using Information & Communication Technology*, 10(2), 103-119.

Abstract: Khan Academy, an online platform offering educational videos and exercises in different content areas, has awakened intense interest among foundations, multilateral organizations, policy makers, and educators about how this tool can help meet the educational challenges facing countries around the world. With support from Intel, Education Development Center (EDC) researchers sought to understand how this technology fits into the complex realities of schools in a developing country. In August of 2013, researchers traveled to Santiago, Chile to conduct research in five schools where teachers are using Khan Academy. We found that the way Khan Academy functions as a digital learning environment changes the ways and the degree to which students engage with and are engaged by the math content; it also changes the way teachers and students interact with each other. Even though the use of Khan Academy may plant the seeds of deeper pedagogical changes such as mastery learning or differentiated instruction, teachers did not

need to change their entire teaching model to start using it. Khan Academy's straightforward approach of providing an endless bank of practice exercises makes it an inviting and universally adaptable tool across different types of teachers, classrooms, and countries.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the impact of online math programs?

Does the implementation method and professional development approach have an impact on success?

PARTICIPANT DESCRIPTION

- * 5 schools in Chile were used
- * 4th - 12th grade students
- * 1 of the 5 schools had more support for teachers because they have math coaches
- * 8 teachers; 6 administrators, and 32 students were interviewed in focus groups

METHOD

- * 25 math lessons were observed with Khan and without
- * An observation guide was used during classroom visits
- * Informal conversations were conducted during observations
- * Focus groups were used

RESULTS

- * Teachers felt that Khan had a positive impact on procedural skills, but not on developing deep conceptual understanding
- * Students felt more confident in their math skills after using Khan
- * This was a qualitative study so there isn't any quantitative data which is something I wish it had. I'm wondering if scores actually changed based on using Khan.

RELATION TO THE AREA OF RESEARCH INTEREST

- * Impact of online math programs on learning and engagement

Marshall, J. C., & Horton, R. M. (2011). The relationship of teacher-facilitated, inquiry-based instruction to student higher-order thinking. *School Science & Mathematics, 111*(3), 93-101.

Abstract: Commissions, studies, and reports continue to call for inquiry-based learning approaches in science and math that challenge students to think critically and deeply. While working with a group of middle school science and math teachers, we conducted more than 100 classroom observations, assessing several attributes of inquiry-based instruction. We sorted the observations into two groups based on whether students both explored underlying concepts before receiving explanations and contributed to the explanations. We found that in both math and science classrooms, when teachers had students both explore concepts before explanations and contribute to the explanations, a higher percent of time was spent on exploration and students were more frequently involved at a higher cognitive level. Further, we found a high positive correlation between the percent of time spent exploring concepts and the cognitive level of the students, and a negative correlation between the percent of time spent explaining concepts and the cognitive level. When we better understand how teachers who are successful in challenging students in higher-order thinking spend their time relative to various components of inquiry-based instruction, then we are better able to develop professional development experiences that help teachers transition to more desired instructional patterns. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Reza Chowdhury

RESEARCH QUESTIONS

- * How does the order of instruction relate to the time spent on the Explore and Explain components of inquiry?
- * How does the order of instruction facilitated relate to the cognitive level displayed by students?
- * What is the relationship between the amount of time spent exploring and explaining concepts and the cognitive level displayed by students?

PARTICIPANT DESCRIPTION

- * 22 participating teachers (12 science and 10 mathematics)
- * came from two middle schools within a large Southeastern urban district.

METHOD

- * Observation was the primary method.
- * Class room observation data were gathered using Electronic Quality of Inquiry Protocol (EQUIP)
- * Key indicator measured: Cognitive level of students, component of inquiry being investigated, * Order of instruction, time spent on component of inquiry
- * Five Components of Inquiry (Noninquiry, Engage, Explore, Explain, and Extend)

RESULTS

- * When instruction provided opportunities for students to Explore concepts before a full explanation occurred and when students were involved in the Explain portion of the lesson, the lessons earned a proficient rating or above (Level 3 or 4) for the indicator entitled Order of Instruction.
- * No significant differences were noted between the two groups of lessons (based on Order of Instruction) regarding the time allocated for the Engage, Explain, and Extend portions of the lesson
- * as the number of intervals spent on Explorations increased, so too did the number of intervals that students were engaged in learning that involved higher-order Cognitive Levels, $r(100) = .539$, $p < .001$
- * It is found that math lessons had a considerably higher correlation between percent of time spent on explain and a Cognitive Level of 1 ($r(40) = .543$, $p < .001$) than science lessons ($r(58) = .290$ $p < .05$)

RELATION TO THE AREA OF RESEARCH INTEREST

- * Inquiry-based learning approaches in science and math that challenge students to think critically and deeply

Martindale, T., Pearson, C., & Curda, L. K. (2005). Effects of an online instructional application on reading and mathematics standardized test scores. *Journal of Research on Technology in Education*, 37(4), 349-360.

Abstract: Standardized tests have become commonly used tools for accountability in public education in the United States. In Florida, the Florida Comprehensive Assessment Test (FCAT) is used to measure student achievement on grade-specific standards and

benchmarks. Various agencies have developed computer-based and web-based software applications to improve student performance on these tests. The purpose of this study was to examine the impact of one such application, FCAT Explorer, on student FCAT scores. We used hierarchical analysis of variance and analysis of covariance to compare scores for schools that used FCAT Explorer, and schools that did not. We examined fourth, fifth, eighth, and tenth grade FCAT reading and mathematics scores for selected elementary schools and high schools. Student scores from elementary schools using FCAT Explorer were significantly higher than scores from elementary schools that did not use FCAT Explorer. At the high school level, we found no significant differences in scores between schools that used FCAT Explorer and schools that did not use the application. (Keywords: high-stakes standardized testing, accountability, computer-based instruction, online instruction, software evaluation.) Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 24 schools participated in the study
- * grades 4, 5, 8 and 10
- * 4th - 586 students
- * 5th - 491 students
- * 8th - 1379 students
- * 10th - 1505 students

METHOD

- * This study looked at the impact that an online instructional application has on standardized test scores in reading and math.
- * experimental and controls groups were used

RESULTS

- * improvements in performance at the elementary level
- * improvements at the secondary level were insignificant

RELATION TO THE AREA OF RESEARCH INTEREST

- * student performance is improved by using online math programs at the elementary level

General Notes:

- * I'm not sure what the online program looked like. That makes a difference to me.
- * Dr. Martindale was one of the authors on this study.

Mendicino, M., Razzaq, L., & Heffernan, N. T. (2009). A comparison of traditional homework to computer-supported homework. *Journal of Research on Technology in Education, 41*(3), 331-359.

Abstract: This study compared learning for fifth grade students in two math homework conditions. The paper-and-pencil condition represented traditional homework, with review of problems in class the following day. The Web-based homework condition provided immediate feedback in the form of hints on demand and step-by-step scaffolding. We analyzed the results for students who completed both the paper-and-pencil and the Web-based conditions. In this group of 28 students, students learned significantly more when given computer feedback than when doing traditional paper-and-pencil homework, with an effect size of .61. The implications of this study are that, given the large effect size, it may be worth the cost and effort to give Web-based homework when students have access to the needed equipment, such as in schools that have implemented one-to-one computing programs. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?

PARTICIPANT DESCRIPTION

* 28 students involved in the study (they started with 93, but because of illness, technical problems, and no Internet at home, they ended up with 28)

* 4 5th grade classrooms

* small town in a rural county

METHOD

* 2 problem sets were used with 10 problems in each set — they were delivered as paper-pencil homework assignments or web-based homework

* counterbalanced experimental design - all students did both paper-pencil and web-based assignments

* pretests and posttests were given

RESULTS

* Students learned significantly more with the web-based homework.

RELATION TO THE AREA OF RESEARCH INTEREST

* Data to support the fact that online programs improve student performance.

* Benefits of computer-based math programs — immediate feedback, time-saving for teachers which frees them up to do other things such as provide assistance to struggling students

* Barriers - access to technology devices

General Notes:

* This is a really study. It makes the connection between the importance of immediate feedback and performance.

* This article talks about the ASSISTment system.

* The article talks about the need for devices — it mentions 1:1 initiatives.

Meyen, E. L., & Greer, D. L. 1. (2010). Applying technology to enhance STEM achievement for students with disabilities: The blending assessment with instruction program. *Journal of Special Education Technology*, 25(3), 49-63.

Abstract: This article discusses the theoretical framework, instructional design, formative assessment results, capacity for national distribution, and generalization of the Blending Assessment with Instruction Program (BAIP) model to other content areas such as science. The BAIP, developed and validated at the University of Kansas, employs technology to align instruction in mathematics with National Council of Teachers in Mathematics Standards. BAIP consists of three sets of Web-based resources that are available 24/7 for students and teachers in grades three through high school. Resources include 276 self-contained mathematic lessons structured around five frameworks (i.e., contextual, teaching, lesson, application, and extension); 417 independent online tutorials that provide immediate feedback to students; and a data reporting system that provides teachers with immediate feedback on student performance to facilitate instructional decision making. The materials are suitable for all learners, with particular emphasis on students with disabilities. Two years of field testing have been completed. ABSTRACT FROM AUTHOR]

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are some of the current educational practices in using online adaptive math programs?

PARTICIPANT DESCRIPTION

* 25,803 students during 2008-2009 school year - the data in this study comes from this school year, but other school years are mentioned

* grades 3-8

* schools from Kansas

METHOD

* teachers were given training on how to use the program

- * students completed math tutorials and data was captured
- * qualitative data was collected from teachers in the form of surveys and reporting systems
- * quasi-experimental design approach was used

RESULTS

- * Students showed a significant improvement in performance using the program
- * I'm not exactly sure how to interpret the exact results because I need a stronger background in research stats
- * Teachers responded very favorably to the qualitative questions

RELATION TO THE AREA OF RESEARCH INTEREST

- * Data to support the fact that online programs improve student performance.
- * Blended approach to using online math programs

General Notes:

- * This article talks about teachers not having strong content knowledge in math and students with disabilities not having opportunities.
- * It talks about what is required for effective tech integration.

Moore, A. J., Gillett, M. R., & Steele, M. D. (2014). Fostering student engagement with the flip. *Mathematics Teacher*, 107(6), 420-425.

Abstract: The article discusses the implementation of flipped classroom to teach mathematical concepts to students of the U.S. Topics discussed include introduction of the concept of flipped classroom by efforts of the Harvard University's physics professor Erik Mazur and engaging students to develop innovative skills through flipped class. Further discussed are different approaches applied for flipped classes.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are some of the current educational practices in using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 8th grade honors Geometry
- * 5 sections of 7th grade Pre-Algebra

METHOD

- * students watched video lectures at home and did problem solving activities in class
- * unstructured interviews were conducted with students

RESULTS

- * homework completion increase by 5.4% in the 8th grade class and 13% in the 7th grade class
- * teacher was able to spend more time working with students in class and getting students to explain and justify their answers

RELATION TO THE AREA OF RESEARCH INTEREST

- * Data to support the fact that online programs improve student performance.
- * Blended approach to using online math programs

General Notes:

- * This article really looks at the flipped model. They used Khan Academy and Brightstorm as their online math programs.
- * This article really gets at the idea of making sure we're teaching problem solving and deep conceptual thinking in class and using online programs from procedural things.
- * Usability matters This article may not be the perfect fit, but I would like to gather info on the concept of the flip. How can online programs be used to do procedures out of class and problem solving in class? Also, this is from the NCTM pub which has a 17% acceptance rate and uses double-blind review.

Nguyen, D. M., Hsieh, Y. J., & Allen, G. D. (2006). The impact of web-based assessment and practice on students' mathematics learning attitudes. *Journal of Computers in Mathematics & Science Teaching*, 25(3), 251-279.

Abstract: This study investigates the effects of web-based assessment and practice on improving middle school students' mathematics learning attitudes. With the use of an experimental design and a combination of quantitative and qualitative methods, the study compared and contrasted the attitude achievement of students, who used the web-based

assessment and practice (WP) with students, who used the traditional assessment and practice (TP). Across multivariate and factor analyses and the transcripts of interview notes, results of the study indicate that with the opportunities of drilling and practicing on the computer and receiving instant scores and adapted feedback, students had gained interests in doing mathematics, and formed a perception that they became smarter in problem-solving. However, the attitude improvements were quite different across ethnic and gender groups. Within the WP group, while male students gained more confidence than females, females expressed stronger opinions on the fact that instant scores and feedback helped them overcome difficulties in mathematics problem solving. Though some limitations still exist with written explanations and partial credits, in comparison with the traditional assessment, the web-based assessment and practice tool in this study substantially helps students build motivation and elevates the meaning of learning and doing mathematics with the use web-based technology. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?

PARTICIPANT DESCRIPTION

- * Middle school math students
- * 74 7th graders - 44 male and 30 females in Southern Texas
- * very diverse groups of participants —African American, White, Hispanic

METHOD

- * quasi-experimental design
- * qualitative and quantitative
- * web-based group worked with practice tasks that were online

- * paper-pencil group worked with practice tasks using conventional paper-pencil
- * pre- and post-surveys were conducted to gather qualitative data
- * 10-minute interviews were conducted with 12 students the last day of the study

RESULTS

- * students had very positive feedback on the web-based system
- * math anxiety was down
- * I didn't see any data in the article to support increase student performance

RELATION TO THE AREA OF RESEARCH INTEREST

- * Benefits - self-paced; immediate feedback
- * Barriers - access to technology

General Notes:

- * This study looked at math attitudes and how a web-based program impacted those attitudes towards math

Okolo, C. M. (1992). The effects of computer-based attribution retraining on the attributions, persistence, and mathematics computation of students with learning disabilities. *Journal of Learning Disabilities, 25*(5), 327-334.

Abstract: The purpose of the present study was to examine the impact of attribution retraining, embedded within a mathematics computer-assisted instructional (CAI) program, on students' attributions, persistence, and mathematics computation. Twenty-nine school-identified students with learning disabilities from five urban schools participated in the study. The sample's mean age was 13.3 years. After blocking on initial attributional patterns, students were randomly assigned to a mathematics CAI program that provided either attribution retraining or neutral feedback. Students used their assigned program for eight 30-minute sessions. Results did not support the contention that attribution retraining would have a significant impact on students' attributions. However, students who participated in the attribution retraining condition completed significantly more levels of the program than

their counterparts who received neutral feedback. Attribution retraining students also obtained significantly higher scores on a test of problems practiced during the CAI program. These results suggest that attribution retraining may be a desirable addition to the type of feedback typically provided by CAI programs. However, they also highlight the need for further research that examines the conditions under which specific attributions are most advantageous.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 29 students with learning disabilities
- * 5 urban schools

METHOD

- * students used math programs for 8 30 minute sessions
- * the program used was Drill
- * the study was looking at attribution retraining — how do student attribute their success or failure?
- * students worked in small groups, worked on computer tasks, and were then asked questions by undergrad students
- * pre and posttest measures were used to measure attribution and computation skills

RESULTS

- * students tended to attribute success to effort and failure to lack of effort
- * students didn't attribute success to ability
- * overall results were insignificant and unreliable

RELATION TO THE AREA OF RESEARCH INTEREST

- * What are the benefits of using online math programs?

General Notes:

* Not a great fit for my research project. It is interesting however.

* I was looking for more info on performance and also perceptions of online programs.

Rittle-Johnson, B., & Koedinger, K. (2009). Iterating between lessons on concepts and procedures can improve mathematics knowledge. *British Journal of Educational Psychology*, 79(3), 483-500. doi:10.1348/000709908X398106

Abstract: Background. Knowledge of concepts and procedures seems to develop in an iterative fashion, with increases in one type of knowledge leading to increases in the other type of knowledge. This suggests that iterating between lessons on concepts and procedures may improve learning. Aims. The purpose of the current study was to evaluate the instructional benefits of an iterative lesson sequence compared to a concepts-before-procedures sequence for students learning decimal place-value concepts and arithmetic procedures. Samples. In two classroom experiments, sixth-grade students from two schools participated (N = 77 and 26). Method. Students completed six decimal lessons on an intelligent-tutoring systems. In the iterative condition, lessons cycled between concept and procedure lessons. In the concepts-first condition, all concept lessons were presented before introducing the procedure lessons. Results. In both experiments, students in the iterative condition gained more knowledge of arithmetic procedures, including ability to transfer the procedures to problems with novel features. Knowledge of concepts was fairly comparable across conditions. Finally, pre-test knowledge of one type predicted gains in knowledge of the other type across experiments. Conclusions. An iterative sequencing of lessons seems to facilitate learning and transfer, particularly of mathematical procedures. The findings

support an iterative perspective for the development of knowledge of concepts and procedures. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?

PARTICIPANT DESCRIPTION

* 2 classes of 6th graders from different schools — 77 students and 26 students

METHOD

* Students completed six decimal lessons on an intelligent-tutoring systems. In the iterative condition, lessons cycled between concept and procedure lessons. In the concepts-first condition, all concept lessons were presented before introducing the procedure lessons.

RESULTS

* In both experiments, students in the iterative condition gained more knowledge of arithmetic procedures, including ability to transfer the procedures to problems with novel features. Knowledge of concepts was fairly comparable across conditions. Finally, pre-test knowledge of one type predicted gains in knowledge of the other type across experiments.

RELATION TO THE AREA OF RESEARCH INTEREST

* Benefits - improved performance especially when it comes to developing procedural skills

General Notes:

* This article really supports my theory that online programs are good for procedures, but not conceptual understanding.

Saxberg, B. (2013). A river of data: Making the learning experience more effective. *Education Next*, 13, 86+.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the current state of online adaptive math programs in math education?

PARTICIPANT DESCRIPTION

* not based on a research study

METHOD

* not based on a research study

RESULTS

* not based on a research study

RELATION TO THE AREA OF RESEARCH INTEREST

* not based on a research study

General Notes:

* This is a pretty good article from a peer-reviewed journal. I want to make sure I think about how data-driven decisions are important in making instructional decisions.

Shu-Chuan Shin¹, Bor-Chen Kuo¹, & Yu-Lung Liu², (2012). Adaptively ubiquitous learning in campus math path. *Journal of Educational Technology & Society*, 15(2), 298-308.

Abstract: The purposes of this study are to develop and evaluate the instructional model and learning system which integrate ubiquitous learning, computerized adaptive diagnostic testing system and campus math path learning. The researcher first creates a ubiquitous learning environment which is called "adaptive U-learning math path system". This system enables students to learn math during their daily campus life with mobile devices beyond web-based education with desktop computers. Moreover, this system can support the adaptive testing and realtime computer-based adaptive remedial instruction after students

complete the situated learning on campus math path using ubiquitous technology. Next, a quasi-experiment research is conducted to explore the instructional effectiveness of this system. The 118 subjects are selected from fifth-grade classes in Taiwan. Experimental results indicate that the proposed system can enhance mathematical achievement and the effect of remedial instruction. Furthermore, students' mathematical connection ability can be improved by the proposed instructional model and learning system. Finally, conclusions for mathematics learning are discussed. ABSTRACT FROM AUTHOR]

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?

PARTICIPANT DESCRIPTION

* 118 5th grades in Taiwan

METHOD

- * quasi-experimental study
- * participants used an adaptive math program which can be accessed on mobile devices
- * participants completed a unit on pattern recognition math concepts
- * results are compared with paper-pencil curriculum materials

RESULTS

- * mathematical achievement is enhanced
- * remedial instruction is improved

RELATION TO THE AREA OF RESEARCH INTEREST

- * benefits - improved student performance
- * barriers - access to technology

General Notes:

* The article talks about improved problem-solving, but I'm not sure how they determined that.

Smith, S. J., & Basham, J. D. (2014). Designing online learning opportunities for students with disabilities. *Teaching Exceptional Children, 46*(5), 127-136.

Abstract: The article provides information on the availability of online and blended learning content and resources that are available for students with disabilities. Topics discussed include ways to determine whether or not online learning content and websites are accessible, the principles of universal design for learning (UDL), and the use of the Volunteer Product Accessibility Template (VPAT). Examples of online content providers including Brain Pop, Khan Academy, and Study Island are provided. INSET: Standards for Web Accessibility.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the current state of online adaptive math programs in math education?

PARTICIPANT DESCRIPTION

* not based on a research study

METHOD

* not based on a research study

RESULTS

* not based on a research study

RELATION TO THE AREA OF RESEARCH INTEREST

* not based on a research study

General Notes:

* This is a really good article from a peer-reviewed journal. It isn't based on a research study, but it's helpful to get a clear picture of what a blended learning environment looks like.

Steenbergen-Hu, S., & Cooper, H. (2013). A meta-analysis of the effectiveness of intelligent tutoring systems on K–12 students' mathematical learning. *Journal of Educational Psychology, 105*(4), 970.

Abstract: In this study, we meta-analyzed empirical research of the effectiveness of intelligent tutoring systems (ITS) on K–12 students' mathematical learning. A total of 26 reports containing 34 independent samples met study inclusion criteria. The reports appeared between 1997 and 2010. The majority of included studies compared the effectiveness of ITS with that of regular classroom instruction. A few studies compared ITS with human tutoring or homework practices. Among the major findings are (a) overall, ITS had no negative and perhaps a small positive effect on K–12 students' mathematical learning, as indicated by the average effect sizes ranging from $g = 0.01$ to $g = 0.09$, and (b) on the basis of the few studies that compared ITS with homework or human tutoring, the effectiveness of ITS appeared to be small to modest. Moderator analyses revealed 2 findings of practical importance. First, the effects of ITS appeared to be greater when the interventions lasted for less than a school year than when they lasted for 1 school year or longer. Second, the effectiveness of ITS for helping students drawn from the general population was greater than for helping low achievers. This finding draws attention to the issue of whether computerized learning might contribute to the achievement gap between students with different achievement levels and aptitudes. (PsycINFO Database Record (c) 2013 APA, all rights reserved)

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

Are intelligent tutoring systems effective?

PARTICIPANT DESCRIPTION

* This was a meta-analysis of empirical research that was done.

* 26 reports with 34 samples were looked at.

METHOD

* To be included in this meta-analysis, each study had to meet 8 criteria. For example, they had to be empirical investigations, audience had to be K-12, subject area had to be math.

RESULTS

* Overall ITS had no negative effect or a very small positive effect.

* When used for a school year of less it had more positive effects.

* Had a more positive effect on students from general population as opposed to low achievers.

RELATION TO THE AREA OF RESEARCH INTEREST

* Impact of online math programs on learning and engagement

Stillson, H., & Nag, P. (2009). ALEKS and MATHXL: Using online interactive systems to enhance a remedial algebra course. *Mathematics & Computer Education*, 43(3), 239-247.

Abstract: A study examined the use of online interactive systems to improve a university's remedial algebra course. Data obtained from 118 students in 2005 and 92 students in 2006 reveal results related to students' responses to learning experiences and tutorials that included text interactive online support and results on students' performance in relation to learning achieved with lectures and work on an online interactive system.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

How do the online math program ALEKS and MathXL compare in terms of effectiveness?
How do students view the use of online math programs in terms of helping them be successful in a math course?

PARTICIPANT DESCRIPTION

- * Fall of 2005 - 118 college students in a Basic Algebra course using ALEKS.
- * Fall of 2006 - 92 college students in a Basic Algebra course using MathXL.

METHOD

- * Two online math programs were used in a blended learning approach. Students attended in-person lecture-based courses and used the 2 online math programs to practice outside of class.
- * Students were surveyed on whether or not they thought the online programs were effective.
- * Exam scores were compared based on the 2 programs.

RESULTS

- * About 90% of the students recognized the need for lecture + online practice.
- * Scores improved for students using MathXL vs. ALEKS, but it was statistically significant.

RELATION TO THE AREA OF RESEARCH INTEREST

- * Impact of online math programs.
- * I'm wondering about the characteristics of what makes a math program effective. This study looked at 2 different math programs, but it didn't provide any details on why one might be more effective than the other.

Notes:

- * Overall this doesn't seem like a great study.

Walkington, C. A. (2013). Using adaptive learning technologies to personalize instruction to student interests: The impact of relevant contexts on performance and learning outcomes.

Journal of Educational Psychology, 105(4), 932-945. doi:10.1037/a0031882

Adaptive learning technologies are emerging in educational settings as a means to customize

instruction to learners' background, experiences, and prior knowledge. Here, a technology-based personalization intervention within an intelligent tutoring system (ITS) for secondary mathematics was used to adapt instruction to students' personal interests. We conducted a learning experiment where 145 ninth-grade Algebra I students were randomly assigned to 2 conditions in the Cognitive Tutor Algebra ITS. For 1 instructional unit, half of the students received normal algebra story problems, and half received matched problems personalized to their out-of-school interests in areas such as sports, music, and movies. Results showed that students in the personalization condition solved problems faster and more accurately within the modified unit. The impact of personalization was most pronounced for 1 skill in particular—writing symbolic equations from story scenarios—and for 1 group of students in particular—students who were struggling to learn within the tutoring environment. Once the treatment had been removed, students who had received personalization continued to write symbolic equations for normal story problems with increasingly complex structures more accurately and with greater efficiency. Thus, we provide evidence that interest-based interventions can promote robust learning outcomes—such as transfer and accelerated future learning—in secondary mathematics. These interest-based connections may allow for abstract ideas to become perceptually grounded in students' experiences such that they become easier to grasp. Adaptive learning technologies that utilize interest may be a powerful way to support learners in gaining fluency with abstract representational systems. (PsycINFO Database Record (c) 2013 APA, all rights reserved). (journal abstract)

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 145 9th Grade Algebra I students
- * rural area outside of a large city in northeastern US

METHOD

- * students used math software that adapted by ability level and personalization
- * students completed 2 consecutive instructional units - unit 6 was personalized and unit 10 wasn't
- * before starting unit 6 students completed an interest survey - this info was used to personalize the content

RESULTS

- * student performance improved significantly
- * response time was also improved

RELATION TO THE AREA OF RESEARCH INTEREST

- * Do adaptive technologies improve performance?

General Notes:

- * This study used an adaptive system that customized problems and scenarios based on what students are interested in.
- * Instead of adaptive it refers to this as intelligent tutoring systems. I usually think of adaptive as changing the level of complexity of questions based on correct or incorrect answers.
- * I haven't seen a lot of stuff on personalizing content and the impact it has. Very interesting.

Ysseldyke, J., Spicuzza, R., & Kosciolk, S. (2003). Effects of a learning information system on mathematics achievement and classroom structure. *Journal of Educational Research, 96*(3), 163-173. doi:10.1080/00220670309598804

Abstract: The authors examined the effects of implementing an instructional system that automates application of evidence-based components of effective instruction on student mathematics achievement and on classroom behaviors known to be related to overall student

achievement outcomes. A treatment group of 157 4th- and 5th-grade students used the intervention in conjunction with the Everyday Math curriculum. Student performance was compared with a within-school control group of 61 4th- and 5th-grade students, as well as all 4th- and 5th-grade students in the district (N = 6,385). The students in the control groups received only the Everyday Math curriculum. Results indicate that the implementation of the instructional management system as an enhancement to Everyday Math resulted in an increase in the amount of time spent on classroom activities that researchers have identified as contributing to positive academic outcomes. Furthermore, students who used the Accelerated Math program demonstrated greater mathematics achievement gains than did the control groups. Reprinted by permission of the publisher.

NAME OF CONTRIBUTOR

Kevin Smith

RESEARCH QUESTIONS

What are the benefits/barriers related to online adaptive math programs?
What is the rationale for using online adaptive math programs?

PARTICIPANT DESCRIPTION

- * 157 4th and 5th graders
- * urban school districts in midwest US
- * 26 students - intensive observation

METHOD

- * a blended learning approach was used —online program, Accelerate Math, in conjunction with print-based math curriculum
- * intensive observation of 26 students
- * computerized observation software was used to track behaviors of teachers and students
- * pretest and posttests were given to all participants to measure performance

RESULTS

- * students who used the online math program, Accelerated Math, showed significant performance improvements
- * students who used Accelerated Math were more engaged in math based on observations

RELATION TO THE AREA OF RESEARCH INTEREST

- * Benefits - self-paced; immediate feedback, student engagement increased

General Notes:

- * This study looked at the popular Accelerated Math program
- * It used a blended learning approach