Educational Media and Technology Yearbook 39

Michael Orey
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Educational Media and Technology Yearbook

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Preface

The audience for the *Yearbook* consists of media and technology professionals in schools, higher education, and business contexts. Topics of interest to professionals practicing in these areas are broad, as the Table of Contents demonstrates. The theme unifying each of the following chapters is the use of technology to enable or enhance education. Forms of technology represented in this volume vary from traditional tools such as the book to the latest advancements in digital technology, while areas of education encompass widely ranging situations involving learning and teaching which are idea technologies.

As in prior volumes, the assumptions underlying the chapters presented here are as follows:

1. Technology represents tools that act as extensions of the educator.
2. Media serve as delivery systems for educational communications.
3. Technology is *not* restricted to machines and hardware, but includes techniques and procedures derived from scientific research about ways to promote change in human performance.
4. The fundamental tenet is that educational media and technology should be used to:
    (a) Achieve authentic learning objectives
    (b) Situate learning tasks
    (c) Negotiate the complexities of guided learning
    (d) Facilitate the construction of knowledge
    (e) Aid in the assessment/documenting of learning
    (f) Support skill acquisition
    (g) Manage diversity

The *Educational Media and Technology Yearbook* has become a standard reference in many libraries and professional collections. Examined in relation to its companion volumes of the past, it provides a valuable historical record of current ideas and developments in the field. Part I, "Trends and Issues in Learning, Design and Technology," presents an array of chapters that develop some of the current themes listed above, in addition to others. Part II, "Trends and Issues in Library and Information Science," concentrates upon chapters of special relevance to K-12 education, library science education, school learning resources, and various types of library and media centers—school, public, and academic among others. In Part III, "Leadership Profiles," authors provide biographical sketches of the careers of instructional technology leaders. Part IV, "Organizations and Associations in North America," and Part V, "Worldwide List of Graduate Programs in Learning, Design, Technology, Information or Libraries," are, respectively, directories of instructional technology-related organizations and institutions of higher learning offering degrees in related fields. Finally, Part VI, the "Mediagraphy," presents an annotated listing of selected current publications related to the field.

The Editors of the *Yearbook* invite media and technology professionals to submit manuscripts for consideration for publication. Contact Michael Orey (mikeorey@uga.edu) for submission guidelines.

For a number of years, we have worked together as editors and the tenth with Dr. Michael Orey as the senior editor. Within each volume of the Educational Media and Technology Yearbook (EMTY), we try to list all the graduate programs, journals, and organizations that are related to both Learning, Design, and Technology (LDT) and Library and Information Science (LIS). We also include a section on trends in LDT, trends in LIS, and we have a section profiling some of the leaders in the field. Beginning with the 2007 volume, we have attempted to generate a list of leading programs in the combined areas of LDT and LIS. One year, we were able to compose an alphabetical list of 30 of the programs that people told us were among the best. However, each year we have worked on being more systematic. Instead of following the *US News and World Report* model and have one top program list, we decided to use some of the same numbers that they use and generate a collection of top 20 lists, rather than attempt to generate a statistical model to generate the rankings list. One thought was to rank programs according to the number of publications that were produced; however, deciding which journals to include was an issue. We have decided to use a 4-year span, in this case 2010 through 2013, as the years to count (since at the time of writing, it is still 2014 and so we do not have a complete year). Furthermore, we decided to only count actual research reports that appeared in one of two journals, *Educational Technology Research and Development* and the *Journal of the Learning Sciences*. These two journals were primarily selected based on the general sense that they are the leading journals in the area of LDT. Noticeably absent is the area of information and library science. So, while these numbers are pretty absolute, choosing to only count these journals is somewhat arbitrary.

The other top 20 lists are based on self-report data collected as part of the program information in the Educational Media and Technology Yearbook. Every year, we collect general information about programs in LDT and LIS and publish this information in the Yearbook. Each year we also collect some additional data. We asked the representatives of each of the institutions to enter the US dollar amount of grants and contracts, the number of Ph.D. graduates, the number of Masters graduates, and the number of other graduates from their programs. We also asked them for the number of full-time and part-time faculty. We then generated a top 20 list for some of these categories. The limitation in this case is that it is self-report data and there is no real way of verifying that the data is accurate. So, while the list of the 30 top programs from the first year lacked hard data, and the lists this year are based on numbers, those numbers may be just as unreliable. In the end, we have a collection of lists that we hope will be of use to our readers. Many of the universities that appeared in the list last year are here again, in addition to many others. More information about many of these universities can be found in Part V of this edition.

There are five top 20 lists in this preface. The first of these top 20 lists is based on a count of publications. We used every issue from the 2010 through 2013 volume years of the *Educational Technology Research and Development* journal and the *Journal of the Learning Sciences*. We eliminated all book reviews and letters-to-the-editor and such. We only used the primary academic articles of these journals. Each publication counted 1 point. If the article had two authors, then each author's institution received 0.5 points. If there were three authors, then 0.33 was spread across the institutions. Also, as an additional example, if there were three authors and two of them were from the same institution, then that institution received 0.66 points and the institution of the remaining author received 0.33. Finally, the unit receiving the points was the University. So, in some cases, you might have publications from two completely different departments in the same journal. Table 1 shows our results.

Table 1 Top 20 graduate programs in the area of learning, design, and technology as measured by the number of publications in *Educational Technology Research and Development* and the *Journal of the Learning Sciences* during the years 2010 through 2013, inclusive

Rank	Institution	Total points
1	University of Georgia	6.9
2	Stanford University	6.3
3	Utah State University	5.0
4	University of Wisconsin	4.4
4	San Diego State University	4.4
6	The University of Texas at Austin	3.9
7	University of Missouri	3.8
7	University of Twente	3.8
9	Brigham Young University	3.7
10	The Pennsylvania State University	3.5
11	University of Maryland	3.2
12	Aristotle University of Thessaloniki	3.0
12	Arizona State University	3.0
12	KU Leuven, Belgium	3.0
12	National Institute of Education, Singapore	3.0
12	Purdue University	3.0
17	Utrecht University	2.8
18	University of Pittsburgh	2.7
19	University of California Berkeley	2.6
20	McGill University	2.5
20	Nanyang Technological University	2.5
20	Columbia University	2.5

The University of Georgia came out as the top LDT program in the world, the same as last year. The rest of the top 5 was a bit of a shake up. Stanford jumped from number 4 to number 2. Utah State, University of Wisconsin, and San Diego State cracked the top 5 this year. Arizona State dropped from 3 to 12 and Nanyang Technological University dropped from 5 to 20. Indiana University dropped out of the top 20 completely from the number 2 position last year. The University of Texas, University of Twente, and Penn State University made the top 10 while not making it to the top 20 last year. Those are some of the biggest moves this year.

The two primary measures of research achievement are publications and grants. While choosing ETRD and IJLS was somewhat arbitrary, the numbers are verifiable. In Table 2, we present the top 20 programs according to the dollar amount of grants and contracts for that program over the academic year of 2012–2013. The only institutions that are both on the list for publications and grants are the Utah State University (3 for publications and 6 for grants), University of Missouri (7 for publications and 11 for grants), and Arizona State University (12 for publications and 3 for grants). So, using publications and grants, Utah State may be the top program in the world for research productivity.

Tables 1 and 2 are measures of research productivity. The remaining three tables are more related to teaching than research. The first, Table 3, shows the top 20 programs in terms of the number of full-time faculty. We also show the total number of faculty which is the sum of full-time and part-time faculty. Rutgers comes out on top for this list. The University of Hong Kong and Regis University have very large numbers of part-time faculty. The others on this list are a bit more traditional in that they have no part-time faculty or at least the number of full-time faculty is greater than the number of part-time faculty (Tables 4 and 5).

The next top 20 list is the number of Ph.D. graduates. This list might be a good measure of research productivity as well as teaching productivity. The number of graduates is self-reported. The number of publications is verifiable, so it is interesting to compare who is on both lists. The University of Georgia is number 1 on publications and 2 on Ph.D. graduates, Utah State University is 3 and 12, University of Missouri is 7 and 4, and Arizona State University is 12 and 12.

Our last top 20 list is based on the number of master's graduates. In our mind, we might consider this an indication of whether the program is more practitioner oriented than say the number of Ph.D. graduates. Regis University is the top in terms of graduates which perhaps is not surprising given that their combined full-time and part-time faculty comes to 165. Towson is right behind them, but in terms of total faculty, they are doing this with just 22 faculty. Rutgers was our number 1 for full-time faculty and a consequence is that they also make number 3 in master's graduates. The only universities that made out top 20 list for publications and also made the master's degrees conferred list are the University of Georgia and Utah State University.

Table 2 Top 20 LDT programs by the amount of grant and contract monies

Rank	University	Department	Total
1	Old Dominion University	Instructional Design and Technology	25,000,000
2	University of Massachusetts, Amherst	Learning, Media and Technology Masters Program/Math Science and Learning Technology Doctoral Program	5,700,000
3	Arizona State University	Division of Educational Leadership and Innovation	2,000,000
4	Wayne State University	Instructional Technology	1,600,000
5	New York University	Educational Communication and Technology	1,500,000
6	Utah State University	Department of Instructional Technology and Learning Sciences	1,350,000
7	The Ohio State University	Educational Technology	1,200,000
8	University of North Carolina, Wilmington	Department of Instructional Technology, Foundations and Secondary Education	1,199,546
9	Georgia State University	Learning Technologies Division	915,000
10	Rutgers-The State University of New Jersey	School of Communication and Information	830,000
11	University of Missouri-Columbia	School of Information Science and Learning Technologies	763,934
12	Indiana University	Instructional Systems Technology, School of Education	600,000
12	University of Geneva	TECFA—Master of Science in Learning and Teaching Technologies	600,000
14	Ohio University	Instructional Technology	500,000
14	University of Central Florida	Instructional Design and Technology	500,000
16	University of Memphis	Instructional Design and Technology	400,000
17	Bloomsburg University	Instructional Technology and Institute for Interactive Technologies	350,000
18	North Carolina State University	Digital Teaching and Learning Program	325,000
19	Emporia State University	Instructional Design and Technology	284,112
20	University of West Florida	Instructional and Performance Technology	260,000

Table 3 Top 20 LDT and LIS programs by the number of full-time faculty (also shown is the total faculty which includes both full- and part-time faculty)

1	Rutgers-The State University of New Jersey	School of Communication and Information	21	36
2	The University of Hong Kong	Faculty of Education	20	110
2	Valley City State University	School of Education and Graduate Studies	20	31
4	Towson University	College of Education	17	22
5	University of Missouri-Columbia	School of Information Science and Learning Technologies	16	18
6	Regis University	School of Education and Counseling	15	165
7	Indiana University	Instructional Systems Technology, School of Education	12	22
8	University of Georgia	Learning, Design, and Technology Program	11	11
8	The University of Oklahoma	Instructional Psychology and Technology	11	11
10	Hacettepe University	Computer Education and Instructional Technology	10	25
10	Utah State University	Department of Instructional Technology and Learning Sciences	10	11
10	Anadolu University	Computer Education and Instructional Technology	10	26
10	Anton Chekhov Taganrog Institute	Media Education (Social Pedagogic Faculty)	10	30
14	Ball State University	Masters of Arts in Curriculum and Educational Technology	8	12
14	Keimyung University	Department of Education	8	10
14	Western Illinois University	Instructional Design and Technology	8	13
14	Georgia Southern University	College of Education	8	8
18	Boise State University	Organizational Performance and Workplace Learning	7	15
18	George Mason University	Learning Technologies	7	11
18	Valdosta State University	Curriculum, Leadership, and Technology	7	12

Table 4 Top 20 LDT and LIS programs by the number of Ph.D. graduates

Rank	University	Department	Total
1	Georgia State University	Learning Technologies Division	14
2	University of Georgia	Learning, Design, and Technology Program	11
2	Wayne State University	Instructional Technology	11
4	Ohio University	Instructional Technology	10
4	University of Missouri-Columbia	School of Information Science and Learning Technologies	10
6	University of Houston	Learning, Design, and Technology Graduate Program	9
7	George Mason University	Learning Technologies	8
7	Indiana University	Instructional Systems Technology, School of Education	8
9	Hacettepe University	Computer Education and Instructional Technology	6
9	University of Memphis	Instructional Design and Technology	6
9	Syracuse University	Instructional Design, Development, and Evaluation Program	6
12	Towson University	College of Education	5
12	Morehead State University	Educational Technology Program	5
12	Utah State University	Department of Instructional Technology and Learning Sciences	5
12	Arizona State University	Division of Educational Leadership and Innovation	5
12	Rutgers-The State University of New Jersey	School of Communication and Information	5
17	Anadolu University	Computer Education and Instructional Technology	4
18	Kansas State University	Curriculum and Instruction	3
18	University of Toledo	Curriculum and Instruction	3
18	Kent State University	Instructional Technology	3
18	Old Dominion University	Instructional Design and Technology	3
18	The University of Southern Mississippi	Instructional Technology and Design	3

Please note that the list only goes to 18, but since there was a five way tie for 18th, the next university would be 23rd place

Table 5 Top 20 LDT and LIS programs by the number of master's graduates

Rank	University	Department	Total
1	Regis University	School of Education and Counseling	200
2	Towson University	College of Education	180
3	Rutgers-The State University of New Jersey	School of Communication and Information	121
4	Azusa Pacific University	School of Education—Teacher Education	90
5	Georgia Southern University	College of Education	75
5	New York Institute of Technology	Dept. of Instructional Technology and Educational Leadership	75
7	Bloomsburg University	Instructional Technology and Institute for Interactive Technologies	70
8	California State University, East Bay	MS Ed, option Online Teaching and Learning	60
8	University of Central Florida	Instructional Design and Technology	60
8	George Mason University	Learning Technologies	60
11	California State University Fullerton	Program: Educational Technology	54
12	Wayne State University	Instructional Technology	48
13	University of Texas at Brownsville	Educational Technology	45
14	Richard Stockton College of New Jersey	Master of Arts in Instructional Technology (MAIT)	42
15	University of Central Arkansas	Leadership Studies	40
15	San Diego State University	Learning Design and Technology	40
15	University of Georgia	Learning, Design, and Technology Program	40
18	University of Nebraska-Omaha	College of Education Department of Teacher Education	39
19	Valley City State University	School of Education and Graduate Studies	36
20	Utah State University	Department of Instructional Technology and Learning Sciences	35

We acknowledge that any kind of rankings of programs is problematic. We hope you find our lists useful. If you have suggestions, please let us know and we will try to accommodate those changes in future publications of the *Yearbook*. If your program is not represented, please contact one of us and we can add you to the database so that you can be included in future issues.

Athens, GA

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Part I
Trends and Issues in Learning, Design, and Technology

Chapter 1
EMTY Introduction

Lucas Vasconcelos

The ever-increasing use and impact of technology in education is undeniable. The prevalence of computers and other technological devices both at the workplace and at home has increased the need for schools and higher education institutions to train and prepare twenty-first-century professionals who can successfully utilize technology for personal and professional purposes. Educators from different fields and grade levels have strived to learn and implement a plethora of technologies to make their students prepare for the upcoming needs of the job market. While many of these technologies used in education continue to evolve over the years, others have just emerged to promisingly address the learner's needs from a different perspective or to address emergent needs. They include but are not limited to websites, videos, blogs, wikis, apps, social media, web 2.0 tools, online games, and virtual worlds. Therefore, educators and researchers have the never-ending challenge of staying abreast of current technologies, adjusting their teaching methods and striving to harness learning.

Regardless of whether these technologies are designed solely to be used in educational settings or they are created for commercial purposes and then adapted to the classroom, using and managing technology-enhanced learning environments is still a challenge for instructors, especially the ones who did not have many opportunities to learn as students how technology may have a significantly positive impact on teaching and learning processes. As Mann (1999) explains the paradox, "technology from the last generation has been proven inadequate and that from the next generation is unproven. With either negative data or none, the field is left to those who promptly make the next generation of technology the worst enemy of the current generation as in, 'next year it will be cheaper, faster, smaller or even—more constructivist. So let's wait'" (p. 241).

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In academia, the role of technology in education is on the spotlight. In fact, a sound number of researches have focused on the use of technology for educational purposes in the last years. As a matter of fact, from 2004 to 2009, manuscript submissions to *ETR&D*, a top-ranked international journal, increased by 72 % (Ross, Morrison, & Lowther, 2010). This growing interest on the topic has shed light onto the instructional technology field and fostered the creation of journals, conferences, and higher education degrees on instructional technology. It is not hard to realize the excitement and frisson many researchers and educators express in their publications or conference presentations toward the impacts of technology in education and how it enables students to learn beyond the campus boundaries or the school walls. On the other hand, critics have argued that technology may improve learning as long as if a good teacher is using it, i.e., the reason for effective teaching and meaningful learning does not rely on technology itself, but on the teacher's expertise, knowledge, and strategies to employ it.

Regardless of whether researchers and practitioners are blindly euphoric, skeptically discouraged, or somewhat in between these extremes, it is important to keep in mind that technology is only a tool, not a learning objective. In other words, effective teaching does not rely on technology use as the ultimate goal, but as the means to achieve instructional goals and to foster new learning experiences. Outcomes such as enhanced academic performance, increased students' motivation, addressed diverse needs, and facilitated collaboration and communication are only a few of the innumerable advantages of using technology in education. Nevertheless, effective teaching and meaningful learning can only be achieved when technology use is thoughtfully planned and carefully aligned with pedagogical curriculum standards, content, and goals. Furthermore, it should be grounded on learning theories.

Further research is still needed in the field of instructional technology due to the fact that technology has been adding new dimensions to the concept of schooling (Lan, 2000). Research has become quite important for professionals from this field because they have the opportunity to review successful experiences and failures related to technology integration research results which might help shape future educators' teaching methods and practices. For instance, they might teach science classes using robotics, math with online games, foreign languages with apps, and so forth. The list of possibilities is endless.

Accounting for the importance of shared research results in instructional technology, this book presents a series of chapters written by scholars in the field. This section of the book presents an overview of these chapters, which were categorized into four overarching topics: (a) issues and trends in the field, (b) game-enhanced learning environments, (c) current researches on teaching and learning with technologies, and (d) pedagogical approaches in technology-enhanced learning environments.

Issues and Trends in the Field

It is important to determine and examine what has shaped attitudes, theories, methodologies, and approaches to the field of instructional technology. Abbie Brown and Tim Green's chapter reports the results of research on the trending topics and issues in instructional technology published on major annual reports. Data was categorized into four main research strands: overall developments, corporate training and developments, higher education, and K–12 education. With regard to overall developments, the authors found out that national and private funding opportunities for academic research are slightly growing due to the continuous US economy recovery. In corporate training and development, the authors reported (a) a slight increase in corporate learning expenditures; (b) the top three content topics for corporate instruction, which are still delivered as instructor-led classroom training in 54 % of cases; and (c) only 39 % of corporate training cases are technology based.

Results on trends and issues on higher education show that faculty and students still have different profiles regarding technology use. Only a small percentage of responding faculty believes online learning is as efficient as face-to-face learning, yet 61 % of them still believe technology can bring a positive impact to education. Grounded on reports, the authors claim the need for increased faculty training and support to develop their digital fluency. Students, on the other hand, have increased access to technological devices, express a preference for blended learning environments, have increasingly enrolled in online courses, and desire a greater integration of technology in academic settings. As for K–12 education, there has been a 2.5 % increase on the total expenditure in instructional technology. Parents, students, and teachers have had more access to technology than in the past, and as a consequence, students are increasingly using mobile devices in the classroom to enhance learning, taking online classes, and using social media and tools to learn outside of the classroom. In conclusion, Brown and Green highlight that even though digital content, online learning, and mobile learning are consistently growing trends, the issues faced in the past year are still unsurprising.

Game-Enhanced Learning Environments

Digital games have been used as educational tools to harness learning for a long time, and the debate on their use has been going on for almost forty years (Egenfeldt-Nielsen, 2007; Games & Squire, 2011). In his chapter, Adam Mechtley draws on cultural–historical activity theory (CHAT) and on epistemic cognition (EC) to highlight the importance of accounting for situated context (historical, social, cultural aspects and constraints) in the process of designing serious games for science education. In addition, he stresses the role of empowering students to recognize and value their individual epistemic aims in science classrooms. After distinguishing and defining inquiry- and expertise-based approaches, Mechtley argues in favor of the latter by stating that the focus of meaningful learning should not be to emulate scientists by fostering understanding but to enable learners to accommodate acquired knowledge and use it to address future real-world situations.

When reviewing the literature on CHAT and EC with an emphasis on their affordances and limitations, Mechtley identifies a lack of empirical data generated by design-based researches that account for context into the process of designing games. In the discussion section, the author explains how learners' epistemic aims, i.e., knowledge-related goals, add up to motivation and learning efficiency in game-enhanced learning environments. He also reviews a few successful games related to science education and makes some final considerations about meaningful learning, games, design, and context to be used as food for thought for future game design projects.

Daisyane Barreto's chapter also provides insights onto online games in education. A comprehensive explanation is conducted on how the words "play" and "game" are oftentimes interchangeably used. After distinguishing them and explaining how these constructs are interrelated, Barreto defines and distinguishes digital games and virtual worlds. Grounded on Olson (2010), the chapter also introduces children's motivations to play digital games, and they are classified as (a) social needs, which can be categorized as intrinsic (competition) or extrinsic (collaborative); (b) emotional needs, which are endogenous or exogenous fantasy; and (c) intellectual needs, which consist of an optimal level of challenge throughout the game, sensory and/or cognitive curiosity toward features of the game, and intellectual conflict, respectively.

As an attempt to shed some light on the process of designing virtual worlds for educational games, Barreto presents and ponders research results regarding the use of two types of virtual worlds in educational settings: Club Penguin™, a commercial virtual world repurposed to be used in the classroom, and Whyville, which was designed solely to harness learning. In summary, both virtual worlds enable children to make sense of content, rules, and social practices through a discovery-based approach.

Current Researches on Teaching and Learning with Technologies

Researches on technology integration to enhance teaching and learning practices are also very relevant for the field of instructional technology. As a matter of fact, current research projects in academia reflect not only the trends and issues in the field but also the scholar's viewpoints of which phenomena and technologies demand further disciplined observation and experimentation that will lead to a better understanding.

Jane Howland, Joi Moore, and Julie Caplow's chapter presents current ongoing researches in the School of Information Sciences and Learning Technologies from the University of Missouri. From the overarching focus on improving performance and access to learning technologies, two major research strands emerge: design of innovative tools and interactions and online learning. Faculty members whose primary focus is to design and develop innovative tools approach this activity from three different perspectives: workflow performance, project-based orientation, and human–computer interaction. Faculty members who aim at enhancing online learning have an eye on online features such as course organization, discussion forums interactions, and students' perceptions of online learning.

Joan Hughes, Min Liu, and Paul Resta's chapter also discusses research projects on technology integration conducted within the Learning Technologies Program at the University of Texas. Their focus, however, relies especially on K-16 educational settings. John Hughes' research has the overarching goal of examining how new and practicing teachers are prepared to optimally use technology to support students' learning. From this broader goal, two research strands emerge: how universities prepare preservice teachers with regard to their knowledge, attitudes, and practices in using instructional technology and technology integration efforts in elementary, middle, and secondary grade schools. Similarly, Min Liu's research has the overarching goal of supporting teacher's teaching and students' learning through effective use of technologies. In this chapter, the results of only two of her research strands are discussed: the design of immersive, new media environments to support learning and motivation and the affordances and constraints of using mobile technologies.

Pedagogical Approaches in Technology-Enhanced Educational Environments

Pedagogical applications of technology in instructional situations are very relevant to the field because they provide empirical results and insights into a specific approach or tool. Maneksha Dumont and Victor Lee's chapter reports the results of an intervention in an alternative high school wherein they document students' experiences of designing, developing, crafting, and sharing computationally enhanced pets or "DigiblePets." With the purpose of increasing awareness to sociocultural aspects of technology-enhanced environments, encouraging creativity, and promoting engagement to at-risk students, the researchers planned a multi-week unit with 12 workshops in which students could learn and tinker with programming language, a prototype program, arts and crafts materials, and the facilitator's expertise.

Using a variety of data collection methods, especially students' own words and descriptions, the chapter presents and compares three students' descriptions and reflections on the project. The analysis of their narratives provided insights on the varied nature of participation and engagement on the computational craft design project. Overall, all students were very successful because they were able to fully develop their interactive and responsive pets. However, a couple of challenges emerged from that experience: (a) hybrid design media such as computational crafts were not given much credence by students, who would rather separate computational, physical, and interactive elements from the multimodal aspects (as a result of this compartmentalization, they did not fully engage with all those aspects, but they stuck to the ones of their preference); and (b) students showed pride and accomplishment toward their products, and they were only comfortable with showing them off in more spontaneous situations to friends, favorite teachers, and staff. As for the sanctioned final design exhibit event, they were oftentimes reluctant to participate.

Susan Land, Heather Zimmerman, Gi Woong Choi, and Brian Seely's chapter presents five design guidelines generated from preliminary design-based researches to create and implement an informal, outdoor, and mobile learning environment. As an attempt to enhance families' visits to an arboretum in Pennsylvania by engaging them in scientific observations, the researchers designed a mobile application equally informed by learning theories and context. The result was an open-ended, ubiquitous, interactive, and learner-centered tool named *Tree Investigators*, which has a focus on trees, their life cycles, and seasonal changes.

As a result from this design and development experience, the authors created design guidelines to inform that process: (a) design a learning environment, not a stand-alone technology, which is only one component of a more complex interaction process between families, technology, naturalist guide, and the specimens within the natural setting; (b) use mobile computer content and prompts from the naturalist to amplify disciplinary aspects of an informal setting; (c) use mobile computer content and prompts from the naturalist to scaffold connections between on-site observations and scientific concepts that explain and represent them; (d) use digital photography attributes of the mobile computer to enable learners to articulate and reflect on their observations and disciplinary concepts; and (e) support all family members, not just parents, to engage as epistemic agents.

Ruele and Mwendapole's chapter presents principles for developing a design- and technology-based curriculum that can be used as a framework to harness twenty-first-century skills such as creativity and innovation on students and to prepare learners to a broader range of career opportunities. The authors describe the background and context of the design and technology education in Botswana, as well as the structure and content of the Botswana General Certificate of Secondary Education (BGCSE) design and technology syllabus. Even though the syllabus is composed of six topic areas, for the purposes of this chapter, the authors focus on only two of them: design and technology. They examine how these two strands are currently employed in the Botswana school curriculum, and at the end of the chapter, they provide insights and recommendations on how to address Botswana's vision of economic diversification by realigning the school curriculum in terms of design and technology skills.

Amina Cviko, Susan McKenney, and Joke Voogt's chapter presents the results of a study with Dutch kindergarten teachers in curriculum design and implementation of PictoPal activities. Their roles throughout the project are classified as executor-only, re-designer, and co-designer. Through the use of case study analysis, each teacher role was examined, and a cross-case analysis was employed to compare their perceptions of (a) their roles, (b) curriculum practicality, (c) co-ownership, (d) integration of on- and off-computer activities, and (e) pupil learning. After reporting and discussing significant differences among teacher's perceptions, the authors recommend that elementary teachers should take part in collaborative design ICT-rich activities in order to prepare them to support early literacy development in kindergarten.

Implication of These Studies to the Field

Based on the chapters presented in this introductory section of this book, the four overarching topics in the field of instructional technology are (a) analysis of trends and issues in utilizing technology to improve teaching and learning processes, (b) online game-enhanced learning environments, (c) ongoing research projects conducted within university departments on teaching and learning with technologies, and (d) pedagogical approaches to technology integration in education. It is important to notice that these topics are the *current* trends in instructional technology, but next year, different topics might be the target of a great deal of research. The ubiquitous, ever-changing nature of technology requires scholars and educators to stay abreast of their most recent changes and, consequently, to ponder and examine the impacts such changes might have on their teaching methods, strategies, and techniques, as well advantages and/or drawbacks.

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Chapter 2
Issues and Trends in Instructional Technology: Leveraging Budgets to Provide Increased Access to Digital Content and Learning Opportunities

Abbie Brown and Tim Green

We continue the tradition of reporting the past year's issues and trends that shape attitudes and approaches to instructional technology. This chapter is comprised of four sections: Overall Developments, Corporate Training and Development, Higher Education, and K–12 Settings. The trends and issues described are based on major annual reports sponsored and/or conducted by organizations including the Association for Talent Development (ATD, formerly ASTD), EDUCAUSE, Gartner Incorporated, the New Media Consortium, the Online Learning Consortium (formerly the Sloan Consortium), and Project Tomorrow. These reports require time in terms of data collection, interpretation, and publication and thus reflect the issues and trends of large groups over long periods of time. For a more immediate review of trending topics in instructional technology, please refer to the authors' biweekly podcast, *Trends and Issues in Instructional Design*, *Educational Technology*, *and Learning Sciences* (Brown & Green, 2014b).

Overall Developments

The nation's economy has slowly continued to recover. Funding for K–12 and higher education rebounded slightly since the last review. The levels of funding, however, particularly in K–12, have not rebounded to the 2008 level prior to the

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decline of the economy. Despite this, K–12 and higher education sectors continued to provide funding to support instructional technology use and initiatives for teaching and learning. Private sector funding for technology once again increased slightly in comparison to the previous year. In all three sectors, instructional technology purchases for hardware, software, and services remained a priority.

Corporate Training and Development

Similar to previous issues and trends chapters of this yearbook (e.g., Brown & Green, 2013, 2014a), we continue to track corporate application of instructional technologies primarily by referring to the *State of the Industry* (Miller, 2013) report published by the American Society for Training and Development (ASTD, though it should be noted that the organization recently renamed itself the Association for Talent Development, ATD). The report is based on data collected from organizations regularly submitting annual data, BEST award winners (organizations recognized by ASTD for their exceptional efforts in support of learning within the enterprise), and Fortune Global 500 companies (the top 500 revenue-producing corporations worldwide). This represents data collected from 475 business organizations. A secondary source used to track corporate trends is Gartner Incorporated's *Hype Cycle for Emerging Technologies* report (LeHong, Fenn, & Leeb-du Toit, 2014).

Learning Expenditures

ASTD reports average corporate learning expenditures increased slightly, from $1,182.00 per employee in 2011 to $1,195.00 in 2012 (Miller, 2013). Smaller enterprises generally paid more, averaging $1,800 per employee; this is at least in part due to the smaller organizations relying on external services and tuition reimbursement plans, as well as having fewer learning and development employees on staff. Larger organizations paid significantly less; companies comprised of 10,000 or more spent an average of $700 per employee (Miller, 2013).

According to the ASTED report, employees continue to use an average of approximately 30 learning hours a year (Miller, 2013). This has remained constant in recent years, and Miller suggests problems in gathering accurate data may be caused by the use of nontraditional training methods such as e-learning, mobile device-based instruction, and informal learning, all of which are more difficult to measure and report than traditional, instructor-led, classroom training.

The average ratio of learning and development staff members to employees was 1:299 (based on adjustments made for outsourcing) (Miller, 2013). The cost per learning hour increased by $4 to $89, which is a smaller increase than recent years' past but still significant. Miller suggests the increased per hour cost may be attributable to technology development costs (e.g., the need to purchase hardware and/or develop software such as tablet-based apps). On average, corporations spent $1,772.00 for every hour of learning they created, which continues a trend in increased spending in this area (Miller, 2013).

Instructional Content

Similar to the previous year's report, ASTD's most recent industry report indicates the top three content topics for corporate instruction are managerial and supervisory, profession and/or industry specific, and business processes, procedures, and practices (Miller, 2013). These three topic areas account for a third of the instructional content available within the responding organizations (Miller, 2013). The content areas that account for the least amount of instructional content are executive development, customer service, and basic skills (Miller, 2013).

Methods of Instructional Delivery

Instructor-led classroom training continues to be the most popular form of delivery. On average, 54 % of all corporate training takes place in traditional, face-to-face, instructor-led settings (Miller, 2013). Technology-based delivery accounts for an average of 39 % of corporate training: this includes (in order of popularity) self-paced online learning, self-paced nonnetworked computer instruction, instructor-led online instruction, instructor-led remote broadcast, DVD or CD recordings, and mobile technology (which accounts for less than 2 % on average) (Miller, 2013).

Gartner Incorporated's *Hype Cycle for Emerging Technologies* report (LeHong et al., 2014) indicates that virtual reality is a maturing technology currently placed in the "slope of enlightenment" phase of the Hype Cycle, suggesting it is a technology to look at closely in terms of instructional delivery. Gamification and augmented reality, however, are currently in the cycle's "trough of disillusionment" and may need more time before it may be realistic to consider its uses for corporate training (LeHong et al., 2014).

Higher Education

We review higher education's instructional technology application by referring primarily to the *ECAR Study of Undergraduate Students and Information Technology* (Dahlstrom, Walker, & Dzubian, 2013), EDUCAUSE's *2013 CDS Executive Summary Report* (Lang, 2014), the *NMC Horizon Report*: *2014 Higher*