Guidelines for Instructional Design Systems

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ABSTRACT

This paper is a literature review of various papers and research on the design guidelines for instructional design systems. After reviewing the literature on instructional design systems and analyzing the research, the paper identifies potential gaps through the papers, specifically the lack of research in professional development and secondary education; why some learners do not absorb the information provided; more fleshed out guidelines; and information on implementation of guidelines.

AUTHOR KEYWORDS

Author keywords: instructional design; design guidelines; game-based instructional design system; professional development; universal design; universal instructional design; secondary education.

INTRODUCTION

As technology improves with time, the prevalence of instructional design systems has increased as well. Instructional design "is the creation of instructional materials" and aims to create "educational and training materials to learners from all walks of life in a variety of ways [11]. Instructional Design System are systems that are primarily used to education or instructional purposes [11]. It can sometimes be called instructional technology in broader terms, which refers to devices for educational purposes [12] but for the purposes for this paper I will be calling the systems instructional design systems. Games-Based Learning Systems are instructional design systems that are based in learning through game play [3]. These instructional design systems are used for a variety of different ages from children learning basic math and reading using a game based instructional design system to adults using instructional design systems for secondary education work and professional development [1, 3, 6, 9]. Homeschoolers and educational institutions have been using instructional systems more and more as a way to make learning more efficient for students, while large and small businesses have been using instructional systems to reduce training costs for employees [1, 3, 6, 9].

For each different type of instructional system, there are different requirements to insure that each system is well designed for the users [5]. The needs of children using games based learning systems is completely different from an adult who is taking part in a company training or college student taking an online class [1, 3, 6, 9]. It is important that the different systems accommodate the learners and allow them to properly absorb the information that they are trying to learn in a way that is efficient and enjoyable [5].

This paper summarizes the various guidelines set forth by different research and guidelines papers from historical and more contemporary sources. It then provides an analysis for each of the sources and searches for a gap in the current research on the subject of Instructional Design Systems. After the literature review, the paper then examines the common themes of the research, which include universal design and games based learning systems. The paper then concludes with an overall summary of the paper and with suggestions for future work.

BACKGROUND INFORMATION AND MOTIVATIONS

Instructional design systems are becoming more and more apart of everyday life as the use of the internet and technology are increasing in our everyday life [1, 3, 6, 9]. Instruction in and out of the classroom is relying heavily on technology, to the point where some instruction is entirely online, and there are even entire education institutions that operate completely online. Nearly every collegiate course has some sort of technology component involved, and increasingly most secondary education involves a technology component [1, 3, 6, 9]. Children use games based learning systems in order to learn the basics and in the non-education sectors, there is a technology component in most trainings for employees of large and small businesses alike [1, 3, 6, 9]. It is important as society continues to rely on these technologies that their design caters to the needs of their learners so that they can fully absorb the knowledge needed for them to be successful [5].

Instructional design began to become an unofficial field of the study in the 1920s, when education became more regulated by local and federal governments [12]. After World War II, instructional technology became more prevalent through the use of devices such as projectors, audio recordings, and photographs [12]. The 1960s found the development of instructional systems, which were more advanced usage of technology in educational settings, such as audiovisual (AV) instruction [12]. The technology boom of the 1980s developed an increased amount of technology in the classroom in the workplace, with computers becoming more and more commonplace in professional, private, and educational settings [12]. This continued into the 1990s, with more computers being used in nearly all situations and instructional settings [12]. With the increased use of mobile

technology in smartphones and tablets, instructional design systems have become more and more widespread [5].

I was motivated to research this topic because of my own personal history with education. I come from a family of educators and have seen them deal with the challenge of instructional design and more specifically instructional design systems. It is my goal to learn more about instructional design systems, the research into their design guidelines, and the research of cognitive learning in order to improve instructional design systems in future projects.

LITERATURE REVIEW

This literature review will focus on several subsections of research for instructional design systems. The first is focused on instructional design basics and cognitive research. The second is general Instructional Design System Principles, such as Universal Design and guidelines for Mobile instructional design systems. The third focuses on instructional design systems for children, specifically games-based learning systems. The fourth focuses on instructional design systems within secondary education and professional training.

Overall, the majority of the research focused on instructional design systems for children and games based learning software. There was a good amount of research for general instructional design principles. However, there was very little research on secondary education and professional development design principles.

In total, there are ten (10) papers from a variety of different sources, perspectives, and time periods. Most of the papers are fairly recent, as the subject of instructional design is fairly new in the past several decades: oldest paper was written in 2002, while the most recent paper was written in 2019 [1, 10]. A majority of the papers were found using the ACM database using Google Scholar. While in most HCI papers, the words user or participant are common, with instructional design research, the word learner is used in conjunction with user or participant.

Instructional Design Principles
The article "Open instructional design" focuses on the concept of Open Instructional Design, which focuses on more experimentation on the actual design than just being aligned to a specific set of rules to instructional design [7]. It also focuses on the idea that the design should be open or "exposed" to the learners, which is different from the traditional mindset, which is where that design is not "exposed" to the learners and that learning is a "by-product of effective exposure to instructional material and instructional activities" [7]. This article analyzed using the idea of Open Instructional Design in a course and they found that the learners were more engaged with this method of instruction than they were with traditional instruction [7]. While the concept and comparison between open instructional design is interesting, this article should have used more comparison with the traditional models, since it

mentioned about comparisons but it did not go deeper into the material or the differences between the different models [7]. This article is another article that talks more about the instructional design, rather than the instructional design systems [7].

The article "Toward Simple Learning Design 2.0" discusses an analysis of the Instructional Design Models that are currently being used: Educational Modeling Language (or IMS-LD) and how it is currently being replaced by a new modeling system for learning platforms: Simple Learning Design 2.0 [4]. This article focuses more on learning design and less on instructional design of systems, while the other articles focus more on instructional design systems. However, it is important to consider Learning Design when crafting instructional design of systems [4]. This article is similar to the "Open Instructional Design" article, with the discussion focusing on instructional design [4, 7].

The article, "Holistic instructional design model and course examination for the four-component instructional design system" focuses on the Four-Component Instructional Design System, also known as 4CIDS, and how it is applied in the education industry [2]. The four components of this model that are required for instructional design are:

- Learning tasks: concrete and whole task that are provided to the learner in order to demonstrate the task.
- Supportive information: information that is supportive to learning
- JIT Information: information that the learner already knows or needs to know before learning
- Part-Task Practice: tasks that are provided to the learner in order to gain a better grasp of the knowledge [2].

The 4CIDS is interesting because it focuses on instruction for the individual tasks, which is a vital part of instructional design systems [2]. Task are required in order for the learners to understand what they will be learning and what is expected of them [2]. The article did focus a bit on exam design, which was a bit disjointed from the rest of the article's focus [2]. This article is also different from the rest of the articles in this subsection because it focuses on exam design, while the other articles, including the "Simple Instructional Design 2.0" that discussed similar instructional design models did not discuss exams [2, 4]. This article also broke down the different principles for the model into easy to understand concepts, which is something that the other articles did not do [2, 4, 7].

General Instructional Design System Principles
The "Universal instructional design principles for mobile learning" article discusses the universal instructional design principles for mobile learning with a focus on distance learning [5]. The article mentions several challenges with mobile learning systems, which include:

- Device variability: there are a wide variety of different devices out there with many different sizes.
- Slow download speed and limited internet access: Not all areas or learners have access to high speed internet.
- Small screen size with poor resolutions, color and contrast: a smaller screen
- Awkward text input: large bodies or text are difficult to read and input on a mobile device.
- Limited memory capacity: different devices have different memory capacities and may not be able to accommodate the program [5].

The article then highlights the opportunities for mobile learning (or m-learning), which include:

- Inexpensive learning opportunities: mobile learning is a relatively cheap way to provide learning opportunities.
- Multimedia content delivery and creation options: There is the ability to add multimedia and creation options to a mobile learning
- Continuous learning: learners can go back and process what they've learned or expand on their knowledge [5].

The article analyzes the previously used design options, and then it discusses 8 principles that are particular to distance learning and their usage [5]. Those principles are:

- Equitable use: meaning it can be used by a variety of different people.
- Flexible use: can be used in a variety of different locations.
- Simple and intuitive: learners can easily learn how to use the systems.
- Perceptible information: the information is easy to understand.
- Tolerance for error: the learners can recover from errors and know those errors.
- Low physical and technical effort: the learners do not need to be advanced at using computers
- Community of learners and support: the learners would have access to other learners and support staff that can help learners when they have issues.
- Instructional climate: an environment that is conducive to learning [5].

While this article provides and interesting perspective on the principles that should be used for universal design for instructional devices, it does not really talk about the 3cognitive research behind these principles, or why these guidelines are important [5]. The article also does not talk about how to implement the guidelines, which would be helpful for design practitioners and software designers who are looking for design an instructional design system [5]. This is something that I have noticed with the articles reviewed is that they will mention the guidelines of the issues

of current systems, but then lack discussion or examples on how to implement those systems [3, 5].

The article "Faculty development and universal instructional design," focuses on how universal design can improve instruction [8]. It summarizes a model of instructional design within universal design, called Universal Instructional Design, which focuses on instruction that is suitable for all students [8]. According to the article, a few changes have been made to the traditional instructional models in order to accommodate Universal Instructional Design [8]. Universal Instruction Design provides a more flexible curriculum for learners who may have trouble with some of required learning of traditional instructional design models [8]. This article, while informative, does not delve into how to actually apply Universal Instructional Design in order to create a more flexible curriculum for learners [8]. This is similar to the "Mobile Instructional Design" article in that it provides guidelines, but does not explain clearly how to use the guidelines provided or examples about them [5, 8].

Instructional Designs Systems for Children
The article, "What's Missing: The Role of Instructional Design in Children's Games-Based Learning" from the 2019 CHI conference on Human Factors in Computing Systems focuses on learning games and how they help with instructional design [1]. The study consisted of having twenty six (26) children use several popular playing games that were learning focused [1]. The findings revealed that the children achieved independent breakthroughs less than half the time while using the learning programs [1]. While those findings are interesting and provide a fascinating perspective on how effective games based learning systems actually are, the article did not really emphasize or look into what could be causing the breakdowns in independent breakthroughs [1]. One obvious theory could be that the children were so focused on playing the "game" that they did not absorb the knowledge that was being given to them. More research needs to be done as to why the children were not absorbing the information like they should have.

The "Ninja Looting for instructional design: the design challenges of creating a game-based learning environment" focuses on creating game-based learning environments and the challenges in the design and development of those programs [3]. "Ninja looting" is a term for when elements of a games based design are appropriated, or "looted" from other games [3]. However, despite historical connotations of looting being bad, Ninja looting is considered a good thing, and this paper describes elements that other game designers can use for their games based design systems [3]. The paper also discusses a number of design elements that can and should be used according to the article in other game-based learning environments [3]. These include adventure and role playing games, which immerse the learners into an environment where they can learn through doing [3]. It also discusses the cognitive based research behind those recommendations [3]. The term ninja looting is not exactly

describe as it should be, and because of its historical negative connotations, it's uncertain as to whether or not the term should actually be used, or if another term should be used, since the term applies more for something similar to open source software, or perhaps open source design. This is different from the "What's Missing" article in that it doesn't discuss the research behind the design elements [1, 3]. This article also while describing elements, it also does not discuss how to implement those elements, or give examples on how to make them work, which is similar to the "Mobile Instructional Design" paper, which also provides principles and guidelines, but no examples or ways to implement [3, 5].

Secondary Education and Professional Training Systems
The article "Applying constructivist principles to reinvigorate faculty training" discusses applying constructive principles to redo faculty training at a higher institution, the University of Delaware [6]. Constructivism is the idea that users already have some prior knowledge when they are learning and then their learning is "constructed" by their previous knowledge [6]. The study involved providing more personal situations and learning to the faculty while they completed their annual training [6]. It involved looking at the faculty members individual goals for annual training and then forming workgroups for the faculty to accomplish those goals with training [6]. The faculty was more able to complete their training goals as a result of the training using the improved instructional design [6]. This paper, while showing a success in important instructional design, did not really focus on the whys, or how the design was improved, except that more support was provided [6]. It would help if this article included more details as to what was actually done and provide more insight into examples to assist designs in creating usable instructional design systems. [6].

The article "Making help desk training interactive and interesting for student technicians" focused on trying to create training for help desk technicians in a university more interesting in order for them to absorb knowledge more intensely [9]. The author created a piece of software called "The Dashboard" using Blackboard as a result of discussion and conversation with student technicians in the Wayne State University IT Help Desk [9]. The goal was to reduce questions that the student technicians had about their training [9]. The student technicians were able to add their own content to the Dashboard in order to provide answers to that other students could find answers easily [9]. This Dashboard reduced the number of calls and questions that student technicians asked [9]. This article, while it shows the success of using instructional design guidelines, the article does not really go into how the author designed the system or implement the design guidelines [9]. The article really just focused on the concept "we needed to make a change, we made a change, it worked," [9]. The "constructivist" article also did something similar, however, in that they also improved an existing instructional design system and then did not elaborate in the results what they actually did [6, 9].

DISCUSSION

Major Themes of the Research
Overall, there are several major themes of the research. The largest major theme is the concept of universal design for instructional design systems. The concept of universal design extends further than just the software screens however [5]. It expands into the actual creation of the curriculum in order to accommodate as many learners as possible [5].

There is also the focus of early childhood education and how children can learn by doing through games based learning systems [1, 3]. Children sometimes have trouble wanting to learn something new, especially if they cannot understand the importance of learning that new thing, however, play can encourage children to learn something without having to feel like, so a games based learning system can help early childhood educators and parents provide learning activities that children can actually enjoy using [1, 3].

Gaps in the Research Sampled
Overall, the main focus of research on instructional systems seems to be on children's systems, specifically game based learning systems [1, 3]. There is ample research on instructional design systems in general, as well as with universal design for instructional design systems [5]. However, there are limited amounts of research on secondary learning [6, 9]. It is important that more research is done in this area in order to make sure that students have an easier time using the instructional design systems [6, 9].

Professional development is expanding for nearly all required trainings for a company's employees to be through an instructional design system or online [6, 8]. This area needs more extensive research in order to improve the design and flow of these systems [6, 8].

The research itself was also lacking in the answering of several big questions [1, 6, 9]. For one the research found issues in the knowledge that is absorbed by the learners, in that quite a few more learners than expected did not absorb the information that they were supposed to learn [1]. The research papers that had findings where the learners did not retain the information did not go into why these gaps in knowledge absorption exist, and what could be causing it [1, 6, 9].

There was also a gap in the research on how to implement the design guidelines or ideas that were set in some of the research [3, 5]. Some of them in the papers were mentioned, but not flushed out [3,5]. It is difficult for practitioners and software companies to know how to implement the guidelines if they are not described in depth [3,5]. The guidelines themselves were not full explained or written out. Some of them were just simply written in a few words or phrases, but nothing concrete to describe the guidelines [3,5].

CONCLUSION
Overall, there has been extensive research into instructional design, for systems and for curriculum creation. Guidelines for instructional design systems for mobile devices and

desktop devices have been written and are being used in a variety of different systems. Instructional Design is being expanded to support as many users as possible through Universal Instructional Design, which creates a flexible curriculum and guidelines for a flexible instructional design system to support those systems. Guidelines for games based learning systems have also been created in order for software designers and games developers to create games based learning systems that promote learning and fun at the same time.

While there has been ample research into instructional design systems for children and universal design, there is simply not enough research for secondary education and professional development systems. More research needs to be done in this area because of its importance to companies and educational institutions. More research also needs to be done in the area of why a learner may not be absorbing the information presented in an instructional design system. Some of the guidelines mentioned also were not written out in great detail, so more work needs to be done in providing examples for those guidelines and assistance for designers wanting to implement those guidelines.

REFERENCES

1. Benton, Laura; Vasalou, Asimina; Barendregt, Wolmet; Bunting, Leona; and Revesz, Andrea. 2019. What's Missing: The Role of Instructional Design in Children's Games-Based Learning. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. ACM,

2. Chen, Xuhui; Cheng, Huiyan; Xu, Shaochun; Wen, Boyu. 2017. Holistic instructional design model and course examination for the four-component instructional design system. 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS). IEEE.

3. Dickey, Michele D. 2006. "Ninja Looting for instructional design: the design challenges of creating a game-based learning environment." ACM SIGGRAPH 2006 Educators program. ACM.

4. Durand, Guillaume, and Downs, Stephen. 2009. Toward Simple Learning Design 2.0. 2009 4th International Conference on Computer Science & Education. IEEE.

5. Elias, Tanya. 2011. Universal instructional design principles for mobile learning. *The International Review of Research in Open and Distributed Learning 12.2*. Pages 143-156.

6. Hyde, Paul, and Nanis, Suzanne. 2006. Applying constructivist principles to reinvigorate faculty training. Proceedings of the 34th annual ACM SIGUCCS fall conference: expanding the boundaries. ACM.

7. Kumar, Vive; Lee, Stella; Manimalar, Priyaadharsini; Somasundaram, Thamaraiselvi; El-Kadi, Munir; and Sidhan, Mohan. 2009. Open instructional design. 2009 International Workshop on Technology for Education. IEEE.

8. Ouellett, Mathew L. 2004. Faculty development and universal instructional design. *Equity & excellence in education 37.2*. Pages 135-144.

9. Shereese, Thomas. 2009. Making help desk training interactive and interesting for student technicians. Proceedings of the 37th annual ACM SIGUCCS fall conference: communication and collaboration. ACM.

10. Sweller, John. 2002. Visualisation and instructional design. *Proceedings of the International Workshop on Dynamic Visualizations and Learning*. Vol. 18.

11. Purdue University. Undated. What is Instructional Design? Purdue University Online. http://online.purdue.edu/blog/what-is-instructional-design. Accessed 12/5/2019.

12. Shrock, Sharon A. 1995. A brief history of instructional development. *Instructional technology: Past, present, and future*. Chapter 2. Pages 11-19.

TABLE OF CHANGES

Suggested Changes	Location	Description
References do not follow the format in the template.	References	Updated References to be in accordance with SIGCHI formatting
In-line citations do not follow the format in the template.	Throughout paper	Updated Citations to be in accordance with SIGCHI formatting.
Include definitions in the Background or Introduction sections.	Background Information	Added more information and history on instructional design systems.
More motivation needs to be included	Background Information	Added motivation
Provide a shorter description of main research.	Review	Shortened some of the long descriptions.
Compare the papers more.	Review	Added more comparison for the papers, also rearranged the papers into 4 subsections so that they could be compared easier.
Add description for reference 4.	Review	Added description for reference 4.
Repetitive passages that can be removed.	Discussion	Removed repetitive passage.
More citations connected to assertions needed.	Throughout paper	Added more citations to assertions.

ANNOTATED BIBLIOGRAPHY

1. Benton, Laura, et al. "What's Missing: The Role of Instructional Design in Children's Games-Based Learning." Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. ACM, 2019.

This article focuses on learning games and how they help with instructional design. The study consisted of having 26 children use several popular playing games that are learning focused. The findings revealed that the children achieved independent breakthroughs less than half the time while using the learning programs. While those findings are interesting, the article did not really emphasize or look into what could be causing the breakdowns in independent breakthroughs. This paper is valuable because it shows direct research on an instructional design system and focuses on the possible breakdowns on using an instructional design systems. This paper will be used as an analysis for specific research on instructional design systems.

2. Chen, Xuhui, et al. "Holistic instructional design model and course examination for the four-component instructional design system." 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS). IEEE, 2017.

This article focuses on the Four-Component Instruction Design System and how it is applied in the education industry. The article mentions the deficits of the system and its weakness and pros. It then goes over a comparison of the instructional models, including the traditional models. The 4CIDS is interesting because it focuses on instruction for the individual tasks. The article does focus a bit on exam design, which I felt was a bit disjointed from the rest of the article's focus. This paper is valuable because it is an in depth discussion and comparison of the different Instructional Design Models. This article will serve as the basis for the different models for Instructional Design.

3. Dickey, Michele D. "Ninja Looting for instructional design: the design challenges of creating a game-based learning environment." ACM SIGGRAPH 2006 Educators program. ACM, 2006.

This paper focuses on creating game-based learning environments and the challenges in the design and development of those programs. The paper also discusses a number of design elements that can and should be used according to the article in other game-based learning environments. It also discusses the cognitive based research behind those recommendations. The game mentions Ninja Looting, but it doesn't really fit into the paper. This paper is valuable because it discusses the design challenges of creating an instructional design systems. This article will be used to identify design principles of instructional design systems.

4. Durand, Guillaume, and Stephen Downes. "Toward simple learning design 2.0." 2009 4th International Conference on Computer Science & Education. IEEE, 2009.

This article discusses an analysis of the Instructional Design Models that are currently being used: Educational Modeling Language (or IMS-LD) and how it is currently being replaced by a new modeling system for learning platforms: Simple Learning Design 2.0. This article focuses more on learning design and less on instructional design of systems, so this article is more educational based than design based on my opinion. However, it is important to consider Learning Design when crafting instructional design of systems. This paper is valuable because it is an in depth discussion on the different Instructional Design models. This article will serve as the basis for the different models for Instructional Design.

5. Elias, Tanya. "Universal instructional design principles for mobile learning." The International Review of Research in Open and Distributed Learning 12.2 (2011): 143-156.

This article discusses the universal instructional design principles for mobile learning with a focus on distance learning. The article analyzes the previously used design options, and then it discusses 8 principles that are particular to distance learning and their usage. While this article is interesting, it does not really talk about the cognitive research behind these principles. This paper is valuable because it lists through various design principles when designing an instructional design system. This article will be used to identify design principles of instructional design systems.

6. Hyde, Paul, and Suzanne Nanis. "Applying constructivist principles to reinvigorate faculty training." Proceedings of the 34th annual ACM SIGUCCS fall conference: expanding the boundaries. ACM, 2006.

This article discusses applying constructive principles to redo faculty training at a higher institution (University of Delaware). The study involved providing more personal situations and learning to the faculty while they completed their annual training. It involved looking at the faculty members individual goals for annual training and then forming workgroups for the faculty to accomplish those goals with training. The faculty was more able to complete their training goals as a result of the training using the improved instructional design. This paper is valuable because it shows research for working on an instructional design system.This paper will be used as an analysis for research on instructional design systems.

7. Kumar, Vive, et al. "Open instructional design." 2009 International Workshop on Technology for Education. IEEE, 2009.

This article focuses on the concept of Open Instructional Design, which focuses on more experimentation on the actual design than just being aligned to a specific set of rules to instructional design. It also focuses on the idea that the design should be open or "exposed" to the learners, which is different from the traditional mindset, which is where that design is not "exposed" to the learners. This article analyzed using the idea of Open Instructional Design in a course and they found that the learner were more engaged with this method of instruction. I feel like this article should have used

more comparison with the traditional models, since it talked about comparison but it did not go deeper into it. This paper is valuable because it explores a different type of instructional design. This paper will be used as an analysis for research on instructional design systems.

8. Ouellett, Mathew L. 2004. Faculty development and universal instructional design. *Equity & excellence in education 37.2.* Pages 135-144.

This article focuses on how universal design can improve instruction. It summarizes a model of instructional design within universal design, called Universal Instructional Design, which focuses on instruction that is suitable for all students. According to the article, a few changes have been made to the traditional instructional models in order to accommodate Universal Instructional Design. Universal Instruction Design provides a more flexible curriculum for learners who may have trouble with some of required learning of traditional instructional design models. This article, while informative, does not delve into how to actually apply Universal Instructional Design in order to create a more flexible curriculum for learners.

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10. Sweller, John. "Visualisation and instructional design." Proceedings of the International Workshop on Dynamic Visualizations and Learning. Vol. 18. 2002.

This article goes more into the cognitive side of instructional design, with a focus on short term and long term memory, schemas, automation and the effects that affect learning. The cognitive side is important because it is important to keep those things in mind while designing an instructional design system. The article while it is very descriptive, does not necessarily give good examples or real life scenarios of the effects that affect learning. This paper is valuable because it discusses the deeper cognitive side of Instructional Design.

This paper will be used as the basis for the cognitive aspects of instructional design.

11. Purdue University. Undated. What is Instructional Design? Purdue University Online. http://online.purdue.edu/blog/what-is-instructional-design. Accessed 12/5/2019.

This article is a basic summary of Instructional Design and how educators can apply it to their daily work.

12. Shrock, Sharon A. 1995. A brief history of instructional development. *Instructional technology: Past, present, and future.* Chapter 2. Pages 11-19.

This article is a review of the history of instructional technology.