SPORTS SCIENCE KNOWLEDGE BASE DEVELOPMENT FOR UNDERGRADUATE STUDIES

Woraniti Akkaraputtidet[1]

Udomluk Koolsriroj[2]

Sitthikorn Sumalee[3]

Abstract: The objectives of this research were to: 1) develop sports science knowledge base for undergraduate studies and to 2) study opinions on expected usages of the Sports Science knowledge base for undergraduate studies. The sample group comprised of 46 undergraduate program lecturers in Sports Science and Exercise Science, who participated in 6th International Conference on Sports and Exercise Science, during 24-26 June 2015 at Convention A, Ambassador City Jomtian Hotel, Chonburi. They were purposively selected as they were ready to participate in the workshop and able to apply Sports Science knowledge base for undergraduate studies, as well as were willing to cooperate in filling out the questionnaires. The tools used in the research were the Sports Science knowledge base for undergraduate studies and questionnaires for the workshop participants, Frequency distribution, percentage and content analysis were used in data analysis.

The research findings were as follows: 1) the Sport Science knowledge base for undergraduate studies consisted of 4 main menus: Knowledge Source; Learn More; Journal/Research Papers and Various Departments, and 13 sub-menus: Sports Science; Physical Fitness; Sports Nutrition and Medicine; Sports Psychology; Sports Science Teacher's standard; Vocabulary List; Additional Learning Sources; Domestic Journal; International Journal; Domestic Research; International Research; Local and Foreign Sports Organizations, and 2) the study of the sample group's expected usage of the Sports Science Knowledge base for undergraduate studies showed that all teachers applied this knowledge to their teaching plans. The most frequently chosen form of usage were to use it as additional media, main media for the classroom, teaching tool for learning outside the classroom and additional media for the classroom. The most used methods were to use it for the students to study more in the classroom, to learn and research more, and to do group projects. The top 3 most used menus were Sports Science (28 persons), Sports Nutrition and Medicine (21 persons), and Physical Fitness (15 persons).

[1] Ed.D. Candidate in Curriculum and Instruction, Department of Education. Faculty of Education, Kasetsart University, Thailand.
Akkaraputtidet_th@hotmail.com

[2] Ed.D., Lecturer, Department of Education. Faculty of Education, Kasetsart University, Thailand
feduulk@ku.ac.th

[3] Ed.D., Assistant Professor, Department of Education. Faculty of Education, Kasetsart University, Thailand.
fedustk@ku.ac.th

Keywords: Sports Science, Knowledge Base, Undergraduate.

Introduction

Sports science is one of the fields offered in Thailand's higher education that employs information technology in its teaching, learning, researching as well as training and competition program development. Nowadays, it is a widely accepted field of study due to its application of various scientific rules and principles. Sports science is therefore a multi-disciplinary subject that spans across several fields. Hagg (1986) classified sports science theories into three categories: 1) anatomical, physiological and mechanical base i.e. Sports Medicine and Sports Biomechanics; 2) social and behavioral base i.e. Sports Psychology, Sports Teaching and Sports Sociology; 3) historical and philosophical base i.e. Sports History and Sports Philosophy.

The first tertiary institutions that pioneered sport science studies for undergraduate degree were Mahidol University, Chulalongkorn University, Kasetsart University, Srinakharinwirot University, Burapa University and Institute of Physical Education. All of which aim to produce quality graduates as educational institutes have four major missions: people building and development, research and development, academic service provision and maintenance of art and culture. Based on the four missions, the goals of the universities are to equip their graduates with quality and help them realize their potential for future occupations.

According to Vorasak Pienchob (2005), the development of human resources in sports science is regarded extremely essential as "people" are the most important factor of development in all aspects. Without knowledgeable individuals or experts, sports science would not be able to grow as a field. At present, although a lot of universities and educational institutes are offering higher degrees (Masters and Doctorates) in sports science, the inadequacy of personnel persists. More importantly, relevant or suitable tasks are not assigned to the existing personnel, resulting in their lack of knowledge, professional expertise and publicly accepted academic work to motivate and gain acceptance for the field. As a result, the necessities to develop and support people and practical research should be prioritized in order to respond to the growing needs of people on sports and exercises. The fields that need immediate attention include exercise physiology, sports psychology, sports biomechanics, sports nutrition and sports technology and engineering.

In addition, the significance of trainers and coaches should not be ignored. They are responsible for training, preparing athletes, teaching techniques and tactics and managing teams of athletes. Modern coaches must be able to apply knowledge and principles of sports science and available facilities to improve and develop their athletes and teams. In countries where sports receive official recognition, coaches are normally trained to develop expertise in analyzing, researching, gathering data and managing teams by experienced, qualified instructors. Based on sports science principles, coaches in those countries will select athletes and continuously develop unique techniques for each individual player. (Sports Authority of Thailand, 2012)

Therefore, it is highly significant that technology information be included in the teaching, learning and developing materials of sports science in today's society. This is to enhance the efficiency and potential of teachers and allow learners to gain knowledge without any limitation. We are hence interested in developing a

knowledge base for sports science for undergraduate studies in order to improve teaching and learning methods and to respond to the growing needs of modern society. This knowledge base is based on Hagg's sports science theory (1986) as well as Bachelor of Science (Sports Science) curriculum offered by Mahidol University, Chulalongkorn University, Kasetsart University, Srinakharinwirot University, Burapa University and Institute of Physical Education. We hope that the knowledge base would contribute to the elevation of sports standard in the country. Furthermore, in all competitions (school-level, provincial, national and international), the principles of sports science are deployed as a criteria for the selection of athletes, training programs, modern technology and a knowledge base for athlete development which satisfies the 5th National Sports Development Plan (2012-2016) and the needs of the society.

Research Objectives

The objectives are:

1. To develop a knowledge base for sports science for undergraduate studies;
2. To study the results of the use of the sports science knowledge base for undergraduate studies.

Research Methodology

This research project is a research for development. The findings from the research will be used to develop formats for a knowledge base for sports science for undergraduate studies. It will be useful for teaching, learning and researching in sports science. The three stages of the research are as follows:

Stage 1 Preparation for Knowledge Base Development

1.1 Study trends, directions and methods of using information technology in teaching
We conducted a study on trends, directions and methods of utilizing information technology in education both in Thailand and overseas. The study was based on textbooks, documents and publications, online sources as well as participations in seminars held by experts. The found data were then categorized and summarized for the second stage of the research – design and develop the knowledge base.

1.2 Explore online sources and other sources
As numerous and various online data can be used to increase teaching efficiency, we explored the internet as the data source, emphasizing on gathering data according to topics extracted from the data analysis which met the requirements from the users. We then categorized the data in order to develop the knowledge base.

1.3 Analyze data from the study in 1.1 and the survey in 1.2
This process was to use the data from the study, find teaching problems and needs for sport science knowledge base, and study trends, directions and methods of applying information technology in teaching from both online and offline sources in order to analyze and summarize these data to develop the knowledge base.

1.4 Summarize the sports science content

We chose sports science topics that should be used to develop the knowledge base, using the data found from surveying teaching situations and the needs for the knowledge base. To develop sports science content, we proceeded as follows:

1.4.1 We studied from manuals of sports science for undergraduate study curriculums from 6 institutions chosen as sample group who used the knowledge base. This was to summarize the content and compare the number of units and subjects to find similarities and differences.

1.4.2 We analyzed the content by studying the manuals from 1.4.1 in detail by making comparison table comparing principles, ideas and main topics to see what each institution taught. We then concluded which knowledge content should be chosen for the knowledge base, with regard to correspondence of the teaching situation survey results, modernity of the knowledge content and practical benefits for the institutions.

1.4.3 The knowledge content were revised to suit online presentation. We then consulted with the thesis advisor committee and adjusted as suggested.

Stage 2: Design and Development – This Stage Is Divided Into 2 Sections:

1. Design of Sports Science Knowledge Base

1.1 Studying the principles of web design and development from textbooks, books, documents, publications, and online sources.

This was to gain insight into quality web design, web development process and proprietary web development tools. In this research, we deployed the knowledge base based on ADDIE Model – a guideline for website/webpage/content design (Richey, 1986: 96 and Seels and Glasgow, 1997: 9).

1.2 Designing the sitemap of the sports science knowledge base

After learning about the principles for web design and development process, we designed the knowledge base sitemap and had it verified by the thesis advisor committee. Adjustments and revisions were made accordingly.

1.3 Script and storyboard preparation

We presented knowledge-based content that were processed through data system management in a form of webpage as designed in 1.2. The website was also equipped with a web navigation system. The committee had verified the format, the sitemap and the content in a form of "data sheet" before the knowledge base was constructed. We then made a storyboard and had it approved by the committee whose comments and feedback was taken into consideration.

1.4 Building the sports science knowledge base

We proceeded to create a homepage and webpages according to the approved storyboard in 1.3, using several tools such as Macromedia Dream Weaver MX, Macromedia Author Ware 5 and Photoshop 6.0.

2. Quality Audit for The Knowledge Base

2.1 Designing a tool for a quality audit

We designed tools to audit the quality of the knowledge base by creating two quality assessment forms, one for content experts and the other for presentation experts.

2.2 Validating the tools

The two quality assessment forms were brought to 5 experts to assure the content validity. The experts considered whether each question corresponded to the objectives and examined the correspondence between the objectives and the assessment forms for each question in order to find an index of Item-Object Congruence (IOC): where

IOC = correspondence between the objectives and the assessment forms

ΣR = summation of scores from all experts

N = a number of the experts

The results from the quality audit by experts, all 16 questions of content assessment showed content validity values between 0.60-1.00, meaning that all the questions correspond to the objectives.

2.3 Selecting qualified experts

We selected 19 qualified experts based their academic background and teaching experience to audit the quality of the knowledge base. The selection was made as follows:

1) 16 experts in sports science content
2) 3 experts in presentation

2.4 Tools used to evaluate the quality of sports science knowledge base

The tools used to evaluate the quality of sports science knowledge base were as follows:

1) Quality assessment form for sports science knowledge base by content experts
2) Quality assessment form for sports science knowledge base by presentation experts

2.5 Data analysis

After gathering data, we checked for completion and validity, encoded the assessment forms, validated the code, and created a coding form. We then processed the data statistically using a computer program. The Statistical values used in the analysis were percentage, mean and standard deviation, and content analysis.

Stage 3: Trial

We organized a knowledge base training program to experiment the usage of the knowledge base on targeted lecturers. The procedures were as follows:

1. Training program preparation

We contacted Assoc.Prof. Dr.Suvimol Tangsujjapoj for permission to have a session to educate participants of the 6th International Conference on Sports and Exercise Science on sports science knowledge base.

2. Sample group

The sample group was purposively sampled; 46 undergraduate program lecturers in the field of sports science who attended the 6th International Conference on Sports and Exercise Science were selected. The knowledge base trial was conducted during 24-26 June 2015 at Convention A, Ambassador City Jomtian Hotel, Chonburi.

3. Assessment Tools After The Trial
    1. Fieldwork record

    During the lecture on applying the knowledge base to teaching and developing sports training programs, which participants were encouraged to learn more from the manual, we assessed behaviors of the participants. Two research assistants took note on participants' participation, questioning, interaction, opinion giving, and suggestion.
    2. Assessment forms after using the knowledge base

4. Data analysis

We checked for completion and validity of data prior to data analysis. A computer program was used in order to statistically analyze data. Statistical values used were percentage, frequency and content analysis. Then, we concluded the results from the analysis and presented in both table and descriptive formats.

Results and Findings

Research results at Stage 1: Results from sports science knowledge base development
To design the sports science knowledge base for undergraduate studies, we performed a study on web design principles through books, documents, publications including the internet. We also explored websites regarding sports science knowledge, articles and researches to combine ideas with the prior study in order to design a site map for the knowledge base. The results of the knowledge base design were as follows:

1. Results of a site map for sports science knowledge base for undergraduate studies

The site map consists of main menus and sub-menus:

1. Knowledge Warehouse consists of 4 sub-menus i.e. 1) sports science 2) physical fitness 3) sports nutrition and medicine 4) sports psychology
2. Learn more consists of 3 sub-menus i.e. 1) sports science teacher standard 2) vocabulary source 3) Additional learning source
3. Journals and Researches consists of 4 sub-menus i.e. 1) domestic journals 2) international journals 3) domestic research 4) international research
4. Various Sectors consists of 2 sub-menus i.e. 1) Local organizations 2) Foreign organizations
5. About the Knowledge Base consists of 2 sub-menus i.e 1) user manual 2) site map

2. Script, storyboard and sports science content

We explored sport science sources from the main menu and sub-menu titles then made a content script according to the specified site map. The study was conducted during August 2014 to May 2015. To make a script, we presented all the content, which were already processed through the data system management as a site map, as designed. This presentation looked exactly like a website.

3. Results of web development

We built the knowledge base in accordance with the site map, the script and the home page; the pages appeared as designed. We then developed a website, publishing data online. We rented a hosting and registered under http://www.sportscienceth.com. The website was verified by both content experts and presentation experts.

4. Results of quality audit

To evaluate the quality of the knowledge base, the assessment forms were brought to 16 content experts and 3 presentation experts. The results from the questionnaires were as follows:

4.1 The sixteen content experts were from Sports Authority of Thailand, Department of Physical Education and universities that offered sports science courses from bachelor's to doctorate degree. Opinions obtained from these experts were that the content were appropriate for teaching and suitable for sports science teachers and students. The content also covered all aspects such as Knowledge Warehouse, details on Sports Science, Learn More, teacher standard, domestic and international journals, and sports organizations that play an essential role in managing and controlling sports business in every country.

The experts also suggested that the questionnaire had too many questions and items to assess, taking them a long time to finish. If the questionnaires have suitable number of questions and satisfy the objectives, the experts will take less time to do and have more time to advise.

4.2 Opinions from the presentation experts were that the knowledge base had good content and was the most suitable, webpage design had appropriate layout and creative presentation, the search system was easy to use and equipped with multiple options, and presenting it as a website was a smart choice. They also commented that the site had excellent data system management with creative graphic design and suitable font format for multiple browsers and could be used by teachers and students at will.

In addition, the experts suggested that text format on the main menu was good but sub-menus should also be listed. When users clicked to link to other websites, the main menu should be retained, making it more convenient for users to search for other information through the main menu or concurrently open other websites.

Research Results at Stage 2: Results of Sports Science Knowledge Base Usage

The seminar was held to allow attendants of the 6th International Conference on Sport and Exercise Science to try out the knowledge base during June 24-26, 2015 at Ambassador City Jomtien Hotel, Pattaya, Chonburi.

The results from the usage showed that everyone would use the knowledge base in their teaching. The forms that the sample group chose to use the most were complimentary media for teachers, main media in the classroom, material for outside the classroom learning and additional media in the classroom. The methods that were chosen the most were to encourage students to study more in the classroom, to study more and search for more information, and to encourage them to do group projects. In addition, the most chosen menus were sports science (28 persons), sports nutrition and medicine (21 persons) and physical fitness (15 persons) respectively.

Conclusion and Discussion

The research of development of knowledge base for sports science can be concluded as follows:

1. The website for sports science knowledge base for undergraduate studies can be found at URL: https://www.Sportscienceth.com. The site is composed of 4 main menus i.e. 1) Knowledge Warehouse of Sports Science 2) Learning more on teacher standard 3) Journals and researches and 4) Various organizations – local and foreign.

2. The results from enhancing the website "Sports Science Knowledge Base" were content improvement, reference linking improvement and text format on the main menu adjustment. We also added sub-menu list so that when users click links to other websites, the main menu remains. This was to allow users to search for other information via the main menu or open other websites concurrently. Moreover, we edited the user manual and embedded it on the website so users could use it as a guideline.

3. We also enhanced our presentation technology, as suggested, by adjusting fonts, illustrations, back button, English menu, line spacing and font color, removing unreferenced links, and creating menu title "Site Map" at the top of the menu.

4. The findings from the usage of the knowledge base showed as follows:

For the "Knowledge Warehouse" main menu, we found that most participants would use the "Sports Science" sub-menu, with the 4th the form of usage – using it as complimentary media for teachers. The method chosen was to encourage students learn more in the classroom. On the other hand, the least popular choice was the "Sports Psychology" sub-menu with the 2th and 4th forms – to use it as additional media in the classroom and as complimentary media for teachers. The method chosen was to encourage students to study more and search for more information.

For the "Learn More" main menu, we found that most of the participants would use "Sports Science Teacher Standard" sub-menu with the 4th form (using it as complimentary media) and the method of encouraging students to study more and search for more information. The least popular way was to use "Additional Learning Source" sub-menu with the 1st form (using as main media) and the method of encouraging students to do group projects/activities.

For the "Journals and Research" main menu, we found that the most popular choice was to use "International Journals" sub-menu with the 4th form – using as complimentary media for teachers. The method selected was to create teaching plans and materials. However, the least popular choice was "International Journals" sub-menu with the 1st form – using as main media in the classroom. The methods chosen were to encourage students to study more in the classroom, do group projects/activities and study more and search for more information (chosen by only 1 person for each method).

For the "Various Sectors" main menu, we found that the most used combination was "Local Sports Organization" with the 4th form of usage (complimentary media for teachers). The chosen method was to encourage students to study more in the classroom. The least used combination was "Foreign sports organization" with the 1st form (main media in the classroom) and the method of creating teaching plan and materials.

Suggestions

We have some suggestions on developing a sports science knowledge base, employing the knowledge base and conducting future research as follows:

Suggestions on Developing A Sports Science Knowledge Base

1. Suggestions on content and menu site map design

1.1 Researchers should completely understand main objectives and a scope of a knowledge base they want to build. They should know how they want to present, what is it for and whom is it for.

1.2 Researchers should conduct an online search to study how to layout the sitemap of main menus and sub-menus appropriately.

1.3 Researchers should be able to search using both keywords and directory search to get desired content. They should then categorize the data and present them according to the designed sitemap.

1.4 Researchers should conduct an online search to study menu layout and data categorization and use them as a guideline to design their own knowledge base.

1.5 Researchers should clearly categorize the content into groups, making them simple and easily accessible. Data management system in the website is extremely essential as it makes the site easy to use and pleasant for the users.

1.6 To specify main menu, researchers should use larger-scale title that covers broad content for the ease of content addition in the future. Naming should be short, concise and suitable for a web menu on the limited space of the website.

1.7 Layout, position and links of the main menus and sub-menus of each page should be concerned to ensure the precision of the search result.

1.8 Researchers should develop websites according to development principals. They should also consider how to deploy the knowledge base in their teaching in order to appropriately design the website.

1.9 Once the knowledge base is successfully developed, researchers should test it on the Sample group and make proper adjustments to ensure completeness.

2. Suggestions on creating a script and developing a website

2.1 The script of each title should show a summary of content and components.

2.2 The script of each page should be detailed, clear, and systemically sorted. This is to clearly link data between main menus and sub-menus.

2.3 After the website is developed, researchers should check content arrangement n sub-menus under the main menus as designed. They should also separately create content files for each sub-menu to make it more convenience for data addition in the future.

2.4 If there are too many pages on the website, researchers should design the website friendliest to the users by deploying a good navigation systems such as having main menus, sub-menus, back button and links to every page.

3. Suggestions on employing the knowledge base

3.1 Teachers should thoroughly explore the content of the knowledge base before employing it to their teaching. They can therefore understand components and usage as well as learn more from the manual.

3.2 Teachers should have their computer devices and network ready and available in advance. They should also prepare suitable learning environment for basic information technology skills and for users i.e. teachers and students.

3.3 The sports science knowledge base for undergraduate studies is an open media available for everyone to access because it is deployed online. It fits for both in class and outside-the-class usage as it has several forms of usage and allows both students and teachers to improve themselves by learning more.

3.4 Sports Authority of Thailand, Department of Physical Education, Institute of Physical Education and educational institutes that offer undergraduate courses in the field of sports science should employ the knowledge base, which is the result of this research, on their official websites. This is to encourage teachers in the department and students to widely use this knowledge base as well as to promote it to other departments and institutions. The website can be an option for sports science teachers and a knowledge source for teachers, students and people.

Suggestions on Future Research

1. There should be a research to study the results of employing the sports science knowledge base for undergraduate studies and various teaching patterns.

2. There should be a research and development on different sports science-related fields that are useful for teachers and students.

3. There should be a research to study academic achievement of students who apply the knowledge base in their learning.

References

Sports Authority of Thailand. 2012. *5th National Sports Development Plan*, (2012-2016) Bangkok: Rung Slip Printing Co., Ltd.

Vorasak Pienchob. (2005). *Teaching principles of Physical Education and Sports Science*. Bangkok: Thai Wattana Panich.

Ambach, J., Perr, C. and Pepenning. (1995) Remote Exploratorium: Combining Network. Center Of Life Long Learning and Design department of Computer Science: University of Colorado.

Ashenhurst J. (2001). *Designing Successful Web Sites*. Internet 05/01. Available: http://www.roughnotes.com/rnmag/mag.html, July 14. 2001.

Beyer, Erick. (1992). *Dictionary of Sport Science*. Postmark: Overlong Karl Hoffman Pp. 616–618.

Haag, Herbert. (1986). *Sport Science Studies: Theoretical Foundation of Spots Science as a Scientific Discipline Contributions to a Philosophy (Met theory) of Sport Science*. Postmark: Verilog Karl Hoffman.

Hojjat. (1990). *Learning Center, the best resource for discovering your family story*. [online].

Hurley, M. 2001. History of e-Learning. *Knowledge Net-History of e-Learning*. Available: http://www.knowledegnet.com/elearningsolutions/overview/history.jspjune6, 2001.

Jack, Duane and Gloria. (2004). Every Child in America Deserves a 21st Century Education and Access to 21st Century Technology, *E-Learning*. Available http://www.ed.gov/Technology/elearning/E-learning.pdf, July 5, 2004.

Kapp, K. M. 2003. E-Learning Magazine: E-Learning Basics. *E-Learning Basics*. Available: http://www.elearnmag.org/subpage/sub_page.cfm?section=3&list_item=16&page=1, August 31, 2003.

Kenneth, C. Laudon and Jane P. (2000) *Web-Based Instruction*. New Jersey: Educational Technology Publications, Inc.

Kirk, David & Timing, Richard. (1990). *Physical Education Curriculum and Culture: Critical Issues in Contemporary Crisis.* New York: The Flamer Press.

Kirwan, John P. Sport Science – What's in a Name?, in Duffy, Pat and Dugdale, Liam. (1994). HPER. *Moving Toward The 21st Century*. Illinois: Human Kinetics.

Knicken, Axel. (1994). *Biomechanics Considerations on Fitness Program to Develop Strength and Endurance*. Cologne: German Sport University Cologne.

Kapoun J. (2004). Public investment in university distance learning programs: Some performance-based evidence. *Atlantic Economic Journal*, 34, 23-32.

Poole, B. J. (2000). *Education for an Information Age*. Boston: Ouebecor Printing Book Group / Fairfield.

Relan, A. & B. Gillani. (1997). Web-Based Instruction and the Traditional Classroom: Similarities and Difference. pp. 41-46. In B.H. Knan. *Web-Based Instruction.* New Jersy; Educational Technology Publications, Inc.

Richards, J. (2000). Opportunities to Enhance Learning with Technology. *E-learning.* Available: http://www.ed.gov/Technology/elearning/e-learning.pdf, July 5, 2001.

Richey, 1996: 96, Seels. And Glasgow. (1997). *E-learning adoption: Three case-studies on e-learning impact on corporate learning strategy*. New York: Communication Culture & Technology Georgetown University.

Roblyyer & Edward, H. (2000). Evaluating Web-Based Instruction Design. Available: http://www.scis.nova. edu/-henkeh/story1.htm, September 23.2001.

Saunders, J. E. (1994). Time for Change? - Models for Curriculum Design in Physical Education Teacher Education, *International Journal of Physical Education*, 31 (1), pp. 19-24.

Seels & Richey J. C. (1994). Prentice Hall's Illustrated Dictionary of Computing. (Second Edition). Sydney: Prentice Hall of Australia Pty Ltd. Office of Educational Technology. 2000. *E-Learning*. Office of Educational Technology. Available: http:// www.ed.gov /Technology/elearning/index.html, July 5, 2001.

Thomas, I. R. (1987). Are We Already in Pieces of First Falling?, *Quest* 39 (2): 114 – 121.

William M. Snyder. (2003) *Communities of Practice: A New Tool for Government Managers.*

Zecevic, L. J. (1994). A Contribution to the Definition of the Body of Knowledge of the Sport Sciences, *International Journal of Physical Education*. 31 (2), pp. 27- 28.