# A Ubiquitous Learning Model for Deaf Students to Enhance Media Literacy in Thailand

**Nantarat Anukool[1]**
**and Sirirat Petsangsri[2]**
Faculty of Industrial Education and Technology,
King Mongkut's Institute of Technology Ladkrabang, Thailand
[1]nantarat.c@gmail.com
[2]sirirat.pe@kmitl.ac.th

*Abstract* - **The purpose of this research was to develop a ubiquitous learning model suitable for deaf students in Thailand. The sample included seven specialists; three persons are educational technology specialists; two persons are information technology specialist, and the other two persons are specialist in teaching and learning for deaf students. Data collection was conducted through a focus group, the research instruments were structure interview form, draft of the ubiquitous learning model suitable for deaf students and suitability assessment form of the draft model. The statistics used in the analysis were mean ($\bar{x}$) and standard deviation (S.D.).**

**The findings from the research provided the final model achieved a high level of suitability ($\bar{x}$ = 4.29, S.D. = 0.58) consisted of four components: interactivity, permanency, accessibility and adaptability.**

*Keywords* - **Ubiquitous Learning, Deaf Students, Media Literacy, Thailand**

## I. INTRODUCTION

Learning in the 21$^{st}$ century is full of changes in teaching and learning systems. Students are required to learn by using advanced information and communications technology, so as to access information rapidly. Teachers or instructors have to adjust and improve themselves to regularly keep pace with technology and adapt the existing technologies to increase efficiency of teaching and learning; for example, searching for essential contents related to lessons, instructional media development, etc. However, they need to be enthusiastic to improve their knowledge and skills at all times by using technology as an important tool for self-development, learning techniques, models and methods of efficient teaching and learning suitable for student characteristics. The Thai Ministry of Education views the importance of brining information and communications technology as an important tool and useful for raising the quality of education, that will increase teaching and learning efficiency and develop teachers or instructors quickly. This is consistent with the National ICT Policy Framework 2011-2020 used as a guideline for developing information and communications technology by specifying the National Broadband Access Policy. It aimed to develop a broadband network that can cover 80% of the population by 2015 and 95% by 2020 to ensure that the service is up to a standard to enhance the development of application software and various content that can be applied in careers and in people's everyday lives. This should include connecting electronic government systems, education services, information services and other government services. Moreover, skill development and information technology capability was also promoted [1].

The Thai constitution in Section 49 B.E. 2550 (2007), specified that a person shall enjoy an equal right to free education for at

least twelve years, completely provided by the state, up to a specified standard. Indigent, disabled, or handicapped persons have rights and are eligible for support from the state to enjoy equal education. The state clearly showed an intention to enable all disabled people to receive basic education equally [2]. The National Education Act also protects the education rights of disabled persons, consistent with the constitution, and support from the state to enjoy education [3]. Once their disabilities are recognized, they are entitled to receive support, thus media, services, and assistance in education and education management for disabled persons must be arranged with quality and efficiency.

Education management for disabled persons differs from that of the general population. Disabled persons have the rights and opportunities to receive special education services and support at birth or as soon as their disabilities are recognized [3]. The state gives importance to education management for disabled persons to ensure that they receive equal education opportunities, so that they will be able to show their full abilities. It is considered that, as soon as disabled persons have higher education, they can help themselves and society and will be more accepted in society and they will able to play their roles in the society more fully. Therefore, education development, suitable for student characteristics, especially those with hearing impairment, is necessary to study environment, readiness and physical characteristics of student learning and perception to ensure that the development of instructional media meets requirements to better improve student learning.

People with hearing impairments are able to see, watch and read like normal people, but are unable to perceive sounds; for example, persons who have hearing loss from hard of hearing to deaf [4]. Generally, they lose their ability to hear, because the hearing organ, like the auditory nerve has deteriorated, causing them to be unable to hear or have unclear hearing and cannot hear sounds less than 90 decibels. Consequently, to enable learning and

learning behavior of these people in a suitable manner, it is necessary to have teaching methods suitable for the learning conditions. Communication with these people can use different techniques, such as sign language, finger spelling, speaking including communicating using gestures. A bilingual bicultural approach teaches the deaf using sign language, which is a natural language of the deaf. Basically, the deaf are taught to use sign language correctly and then start to learn written languages, such as Thai, as a second language [5].

We found that most of the deaf had learning problems in reading and writing Thai, as they spent more time for communicating than other normal people. The other reason is a lack of instructional media suitable for deaf people perception. The most suitable perception ability is seeing, watching and reading, as the deaf can see in the same way that normal people can, but with limited sound perception. Sign language communication is another method suitable for deaf people's learning [6].

The media consisting of images, sound, sign language and subtitle are suitable instructional media for deaf students.

In this regard, the application of ubiquitous learning is beneficial to increase student learning capability, as students can learn, ask for support from a computer network and access information technology at all times. Ubiquitous learning is both active and adaptive. Active learning contributes student-student interaction, student-teacher interaction or student-specialist interaction, as well as the learning. With this model, students have a good chance to participate in any learning activity, while adaptive learning can fulfill the differences and demands of each student in accordance with ubiquitous learning [7].

We found that teaching and learning management for persons with hearing impairment had many problems. Studying problem conditions and demands of learning aids from teachers and deaf students at a secondary school of audiology revealed that teachers had fair computer and internet skills,

developed instructional media, but the major obstacles were lack of tools and equipment, lack of instructional media produced specifically for deaf students, and lack of skills and readiness to use media. The other, but important, problem was a lack of support and enhancement of using learning aids from their administrators [8]. We also showed that a learning limitation, included that students were unable to perceive sounds but they could see, watch and read messages and sign language [5], so that it was difficult for teachers to communicate with students. As a result, teachers had to improve their teaching skills to be consistent with student learning needs or generate instructional media, that can make students to learn more easily, as the media will act as a mediator to make students understand and thus quality media will make students learn faster. Therefore, development of instructional media suitable for deaf students is really necessary, as today instructional media that can respond to their demands and is suitable for them was not sufficient. Further, teachers lacked sign language skills, which most audiology schools use as a medium for transmitting knowledge to students.

Thus a study on the context of students and their actual conditions played an important role to enhance suitable instructional media development for deaf students. We obtained data from interviewing teachers in the School of Audiology in Songkla Province and learned that the teaching and learning plans of the school adhered to the basic education core curriculum introduced by Office of the Basic Education Commission (OBEC) but teaching and learning was modified to suit hearing impaired students, since they spent a long time to understand a lesson. Teachers repeated a lesson to help students memorize and understand better. PowerPoint was used for lesson presentation, exercises and worksheets were assigned to students, group work, and students were required to present their projects. In the computer subject, it is a subject requiring memory and special or technical terms, that students needed more time to understand. Sometimes they understood

what was explained in sign language, but when they wrote, they made spelling mistakes. Teachers had to ask them again and allowed them to explain in sign language. Thus teachers had to use many steps to make students understand in each topic.

Consequently, we saw the importance of helping enhance teaching and learning for deaf students to ensure that teachers acquired instructional media suitable for student characteristics and minimized lesson planning time. We aimed to develop ubiquitous learning for deaf students, to enhance their media literacy, by integrating instructional media, displaying text messages, images, sounds and videos accompanied by sign language to be consistent with and suitable for perception or learning.

## II. RESEARCH OBJECTIVE

To develop a ubiquitous learning model for enhancing media literacy of deaf students.

## III. FRAMEWORK FOR FOCUS GROUP

To create a ubiquitous learning model, it was necessary to study basic student data, so to determine learning characteristics, including conditions, that lead to student development. As soon as the model was recognized, instructional media models suitable for students with hearing impairment will be developed accordingly. The procedures used for creating the model were:

1) Synthesize principles, concepts, and theories associated with ubiquitous learning for deaf students: from previous work, we classified working characteristics and formed a draft model of ubiquitous learning that could respond to individual demand of deaf students.

2) Gather data on persons associated with deaf students: Information from educational institution administrators, teachers, and students of audiology schools was studied with regard to administration and management of education for deaf students. Basic information on current problem conditions, backgrounds of deaf students and guidelines for problem

solving were studied from previous papers on teaching and learning management for students with hearing impairment. Teachers in audiology schools were interviewed to obtain information for synthesizing problem conditions, that arose in teaching and learning for deaf students, including studying lesson plans, preparation of subject contents, following the lesson plans, suitable for deaf students.

3) Create a ubiquitous learning model for deaf students

From obtained information from the synthesis, principles, concepts and theories, we designed suitable elements for developing new instructional media, checked by specialists in educational technology, information technology and teaching and learning for deaf students. Structured interview forms and focus group discussions introduced by Krueger (2002) were used. Participants in design and focus group activities consisted of six to eight persons per group.

## IV. LITERATURE REVIEW

Here we summarize key topics in the ubiquitous learning to design a model prototype and assess suitability for deaf students.

### A. *Principles and Concepts of Ubiquitous Learning*

Ubiquitous learning can happen anywhere and anytime by using sensor technologies, mobile devices and wireless communication. A ubiquitous learning environment is any setting that students can access information. Elements of ubiquitous learning and important parts of teaching and ubiquitous learning are discussed here:

Weiser (1993), [9] said that ubiquitous computing was a computer that can connect to any device via a stable network system, enabling people to access information anywhere.

Jones and Jo (2004), [10] mentioned four components of ubiquitous learning environment as 1) Microprocessors with memory embedded in every object or device. The information each microprocessor will hold will be related to the object. When a student approaches, a sensor detects their presence and will start relaying information to the student PDA, 2) Ubiquitous Learning Environment (ULE) Server Module will include the server, the educational strategies unit and a database: The ULE server manages the network resources; the educational strategies unit allows for the application of strategies to reinforce and aid student understanding through interaction and feedback. It analyses student responses to short quiz questions and returns more information or information in a different form when needed; a database stores all the data about the "objects or devices", the users and the interactions that occur, 3) Wireless Technology - this use a wireless technology like Bluetooth and WIFI, and 4) Sensors will be used to detect changes in surroundings. These will be placed adjacent to the objects or devices and will be used to recognize student presence. The sensors used will include proximity, to detect movement, and light, to detect changes in light intensity.

Li (2005), [11] stated that the ubiquitous learning had five main characteristics: 1) Permanency; learners' learning process is recorded every day, 2) Accessibility; learners can access information anywhere and anytime, 3) Immediacy; learners can retrieve information required immediately, 4) Interactivity; learners can interact with peers, teachers and experts efficiently and effectively through different media, and 5) Positioning of instructional activities help learners solve a problem in a teaching and learning situation.

Bomsdorf (2005), [12] said that ubiquitous learning had six components: 1) Permanency; learners never lose their work unless it is purposely deleted and learning process are recorded continuously everyday, 2) Accessibility; learners have access to their documents, data or videos anywhere. Information is provided based on their requests, 3) Immediacy; wherever learners are, they can access any information immediately, 4) Interactivity; learners can interact with experts, teachers, or peers efficiently and effectively, 5) Situating of

instructional activities; the problems encountered as well as the knowledge required are all presented in their natural and authentic forms. This helps learners notice the features of problem situations that make particular action relevant, and 6) Adaptability; learners can get the right information at the right place with the right way.

Ley (2007), [13] said that four components of ubiquitous learning are: 1) Identification; can identify and sharing information by using Radio Frequency Identification (RFID) tags and visual barcodes, 2) Location; can provide where the information is located, 3) Sensing; tracking system to get accuracy information immediately, and 4) Connectivity; utilizing wireless devices for accessibility.

Liu (2009), [14] there are nine characteristics of ubiquitous learning as: 1) Permanency; learning processes, learners behaviors keep doing permanently, 2) Accessibility; learners can access information from anywhere and anytime, 3) Immediacy; information can be accessed immediately, 4) Interactivity; interactive between learners and teachers, 5) Situation; learners can get the knowledge and experience from actual situations, 6) Calmness; devices a part of learning process, 7) Adaptability; learners can utilize devices to get knowledge in any environment, 8) Seamlessness; learners can learn continuously even have changed of environment, and 9) Immersion; learners have experience, feeling and emotions similar to reality when having interaction with virtual objects and environments.

Bruce (2016), [15] said that ubiquitous learning involves six components as: 1) teaching and learning through wired and wireless technologies, 2) learning from anywhere and anytime, 3) adaptive learning, 4) Ubiquitous Learning Environment – (ULE), 5) connect to a network at anywhere, and 6) service access can be changed subject to situations (places, devices, and others).

Petmanee and Nilsook (2010), [16] mentioned that four components of ubiquitous learning are: 1) fundamental technology that allows computers to be used at anywhere and anytime, 2) hardware technology with suitable human interface is friendly, 3) accessible technology is accessibility or utilization of various devices provided on a network system, and 4) application technology can provide services to users.

Intachote and Sopeerak (2015), [17] summarized that three components of a ubiquitous model are: 1) learning can happen anywhere and anytime, 2) it can facilitate wireless devices, and 3) it is used for communicating and sharing knowledge.

Phumeechanya (2015), [18] mentioned that ubiquitous learning includes four parts as: 1) using mobile devices, 2) wireless communication, 3) management system of ubiquitous learning, and 4) checking the learning context.

Therefore, it can be concluded that ubiquitous learning is the use of a new education model, causing learning not to be static and be seen from different perspectives. The horizon of learning is broadened by integrating technologies and actual environments, that allow learners to access lesson contents more efficiently, encouraging them to be enthusiastic to learn at all times. Ubiquitous learning is not only beneficial to people working in the technology field but also anyone, interested in learning activities outside the classroom as well.

### B. Teaching and Learning of Students with Hearing Impairment

1) Definition of hearing impairment: Persons with hearing impairment or deaf people are classified by hearing ability as follows:

Thai Ministry of Education (2009), [4]: From the notification of Ministry of Education on the determination of categories and criteria of disabled persons in education B.E. 2552 (2009), persons with hearing impairment are persons with a mild hearing loss to a profound hearing loss which can be divided into two types as: 1) deaf persons mean persons with a profound hearing loss and are unable to

understand speech through hearing regardless of wearing or not wearing hearing aids. In general, profound hearing loss is greater than 90 decibels and 2) hard of hearing person refers to an individual who has a mild-to-moderate hearing loss who may communicate through spoken language. Generally, they wear hearing aids the degrees of hearing loss range from lower than 90 decibels to 26 decibels.

Thamsang (2007), [5] defined persons with hearing impairment by levels of hearing ability. The different levels shape their listening ability and understand a different. If hearing impairment occurs at birth, sign language is used for communicating with deaf people and spoken language is used with people who are hard-of-hearing.

Jansawang (2013), [19] defined a person with hearing impairment as a person who is not able to hear as normal people with hearing level of 25dB or above – is said to have hearing loss.

The school of audiology in Songkla province (2007), [20] defined a person with hearing impairment as a person with a mild hearing loss to a profound hearing loss and hearing loss has an effect on language development, causing language learning and understanding cannot be implemented at a normal pace.

2) Learning of persons with hearing impairment: Learning characteristics of students with hearing impairment are most likely based on sign language for communication. The researcher studied learning characteristics of students with hearing impairment which can be concluded as follow:

Thamsang (2007), [5] defined persons with hearing impairment that in general hearing impaired persons consist of persons who can be classified into 2 major types as persons with a mild to moderate-severe hearing loss or known as "hard of hearing persons" and persons with a severe to profound hearing loss

or known as "deaf persons". However, in an educational system, the definition of hearing impaired persons refers to levels of hearing based on medical and scientific approaches called audiology that divides levels of hearing. Sound intensity (also referred to as sound power or sound pressure) is measured in units called decibels (dB); 0-25 dB = normal hearing, 26-40 dB = mild hearing loss, 41-50 dB = moderate hearing loss, 51-70 dB = moderate-severe hearing loss, 71-90 dB = severe hearing loss and greater than 70 dB = profound hearing loss.

Hearing impairment is classified as a disability as stated in the definition prescribed in the Persons with Disabilities Education Act B.E. 2551 (2008). However, the most acceptable definition of persons with disabilities is the definition similar to that of The United Nations that focuses on ability to hear in everyday life; for example, deaf persons means persons with severe to profound hearing loss that may occur at birth or later. Such hearing loss triggers deficiency in hearing sounds especially voice, causing them be unable to understand spoken language, regardless of using or not using hearing aids. Persons in this group use sign language for communication. Hard of hearing persons are persons who have a mild hearing loss to moderate-severe hearing loss and such hearing loss triggers deficiency in hearing voice regardless of using or not using hearing aids but they understand spoken language. Persons in this group use speaking for communication.

To sum up, the important factor determining the definition of persons with hearing impairment depends on different levels of hearing that bring about difference in ability to hear voice and understanding of spoken language. If such deficiency occurs at birth, it will have an effect on a communication model of each individual as sign language may be used in case of deaf persons or spoken language may be used in case of hard of hearing persons (Heward, 2006) [21].

We studied learning of persons with hearing impairment and found that the teaching and

learning in an international environment consists of 6 parts as: 1) teaching by speaking, 2) teaching by using sign language, 3) teaching by speaking and finger spelling, 4) using all communication systems and information system, 5) teaching with a bilingual program, and 6) cochlear implant surgery.

With regard to the learning of persons with hearing impairment in the country, it comprises 2 parts as: 1) teaching how to speak and 2) using sign language while teaching persons with hearing impairment includes sign language and teaching how to listen and speak, and lip reading teaching.

Pratheeppornsak (2005), [6] mentioned an important study consistent with a perception method of students with hearing impairment; that is persons with hearing impairment perceive things from what they see such as using sign language. Teaching and learning must be provided with sound and image media including computer technology media, which can be divided into 3 parts as: 1) perceiving things from seeing and sign language, 2) sound and image media, and 3) computer technology media.

## C. Media Literacy

There are five components as body of knowledge for "media literacy" that should be developed and adapted to be suitable for learners' learning processes as: 1) media exposure (Access Skill), 2) media analysis (Analyze Skill), 3) media evaluation (Evaluate Skill), 4) media creation (Create Skill), and 5) participation in expressing opinions and utilizing media (Participate Skill) (Tessa Jolls, 2008 and Prakorn Prajanban, 2015) [23-24]. Details of each component to be used as the criteria for evaluate behaviors in each component are:

1) Media exposure (Access Skill) is used to evaluate behaviors associated with ability to perceive, create a chance, and search for information; ability to store information, memorize and understand media,

2) Media analysis (Analyze Skill) is used to evaluate behaviors associated with ability to inform and describe fact, to review advantage, disadvantage, and impact; ability to inform and describe main and hidden objectives correctly, comprehensively, accurately and ability to give reasons supporting analysis results,

3) Media evaluation (Evaluate Skill) is used to evaluate behaviors associated with making decision to believe or not to believe; ability to identify, interpret and judge the value, righteousness, and appropriateness of media,

4) Media creation (Create Skill) is use to evaluate design behaviors for presenting information about selection results appropriately, presenting news and information openly, producing media that are planned and searched according to objectives, using media technologies to correct and publicize efficiently including expressing opinions creatively,

5) Participation in expressing opinions and utilizing media (Participate Skill) is used to evaluate participatory behaviors in expressing opinions, interacting with other people and giving a chance to other people to take participation.

Based on this part, the researcher made a tool as a media literacy measurement form to measure media literacy of students with hearing impairment according the criteria of behavior evaluation in each component as mentioned above.

## V. RESEARCH METHODOLOGY

Development the Ubiquitous Learning Model for Deaf Students to Enhance Media Literacy can be described by using focus group as follow:

### 1) Focus group discussion: There was divided into 3 steps as follow.

**Step 1:** Preparation Synthesizing Principles, concepts, and theories of ubiquitous learning were designed suitable components for deaf students with the following procedures:

1) Creating structure review form.

2) Gathering commentaries from seven specialists, consisted of three persons are educational technology specialists, two persons are information technology specialists and two persons are teaching and learning specialists for deaf students.

3) Analysis commentaries and data in order to improve ubiquitous.

We created a draft of the ubiquitous learning model having seven components known as "IPISSAA Model" which comprises: 1) Interactive – communication, 2) Permanency – understand and remember in knowledge, 3) Immediacy – the information can be retrieved immediately, 4) Situation – learning in a real situation, 5) Sensors and Wireless Technology – sensors will be utilized for detecting and wireless technology make information easily accessible and contribute to educational functionality, 6) Accessibility – the information is always available whenever the learners require, and 7) Adaptability – learners able to get knowledge in any environment, as shown in the Fig. 1. When the components become "IPISSAA Model" continue to focus group as next process.
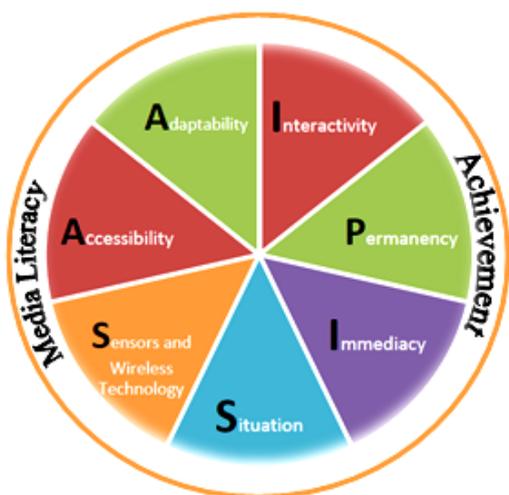


**Fig. 1** Draft of the Ubiquitous Learning Model for Deaf Students to Enhance Media Literacy "IPISAA Model"

***Step 2:*** Focus group discussion: The moderator conducted the focus group by asking opinions of specialists as well as

allowed they discussed reasonably.

***Step 3:*** Conclusion: When the focus group discussion was ended, the moderator made a conclusion and proposed specialists to check accuracy including confirm the information once again and add some missing points.

***2) Data analysis: The suitability evaluation of model was analyzed by using mean ($\bar{x}$) and standard deviation (S.D). Criteria determining 5 levels according to Likert's guideline on the table I.***

**TABLE I**
**INTERPRETATION OF LIKERT'S SCALE**
**FOR SUITABILITY EVALUATION**

| Scale | Interpretation | Scale Range |
|---|---|---|
| 5 | Highest | 4.50-5.00 |
| 4 | High | 3.50-4.49 |
| 3 | Moderate | 2.50-3.49 |
| 2 | Low | 1.50-2.49 |
| 1 | Lowest | 1.00-1.49 |

***3) Suitability evaluation results of the draft learning model:***

**TABLE II**
**SUITABILITY EVALUATION RESULTS**
**OF THE DRAFT LEARNING MODEL**

| Lists of Evaluation | Evaluation Results | | Levels of Suitability |
|---|---|---|---|
| | $\bar{x}$ | S.D. | |
| 1) Learning model | 4.29 | 0.67 | High |
| 2) Components of the learning model | 4.07 | 0.83 | High |
| 3) Teaching methods and instruments | 4.34 | 0.48 | High |
| 4) Utilization | 4.43 | 0.50 | High |
| **Overall** | **4.29** | **0.58** | **High** |

Based on the Table II, the suitability evaluation results of the draft learning model for enhancing media literacy of deaf students from the specialists found that in general the mean was 4.29 and the standard deviation was 0.58, considered to be highly suitable. However, in terms of each topic, the mean of learning model was 4.29 and the standard deviation was 0.67, considered to be highly suitable, the mean of components of the learning model was 4.07 and standard deviation was 0.83, considered to be highly

suitable. The mean of the teaching methods and instruments was 4.34 and standard deviation was 0.48, considered to be highly suitable and the mean of utilization was 4.43 and standard deviation was 0.50, considered to be highly suitable.

In accordance with the data analysis results, the learning model was suitable. The specialists suggested the improvement could be made to be consisting of teaching and learning activities should be clearly specified, conformity between learning contents and media literacy, and diversity of media.

Furthermore, the specialists confirmed the development of the ubiquitous learning model for deaf students for enhancing media literacy. There were four components as Interactivity: I, Permanency: P, Accessibility: A, and Adaptability: A. therefore we named model as IPAA is shown in the Fig. 2.



**Fig. 2** The Ubiquitous Learning Model for Deaf Students to Enhance Media Literacy or Called "IPAA Model"

Each component can be described as follow: Component 1: interactivity; the learners can interact for each others, teachers and involve with knowledge sharing. Component 2: permanency, the learners can understand and remember in knowledge. Component 3: accessibility; the learners can access the information from anywhere and anytime by using wireless technology to connect any devices including utilize sensors to receive information. And Component 4:

adaptability; the learners can learn in any environment which are able to solve the problem under encounter situation.

## VI. CONCLUSION

The ubiquitous learning for deaf students in accordance with the "IPAA Model" was integrated for the teaching and learning. In terms of teaching and learning activities, there are small group discussion, participation learning, and collaborative learning including using media with diversity such as augmented reality instructional media, video calls across the networks, using websites as instructional media. In addition, contents enhancing media literacy. We expected that the teaching and learning in accordance with the "IPAA Model" will make students have improvement in learning achievement.

In Phase 2, when "IPAA Model" is completed, we will apply the model to develop instructional media, measure learning achievement and measure media literacy.

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**(Arranged in the order of citation in the same fashion as the case of Footnotes.)**

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