THE EFFECTS OF APPLYING GAME-BASED LEARNING TO WEBCAM MOTION SENSOR GAMES FOR AUTISTIC STUDENTS' SENSORY INTEGRATION TRAINING

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ABSTRACT
This study aims to explore the effects of applying game-based learning to webcam motion sensor games for autistic students' sensory integration training for autistic students. The research participants were three autistic students aged from six to ten. Webcam camera as the research tool wad connected internet games to engage in motion sensor games. Through the motion sensor games, the researchers were able to collect data from physiological monitoring, observation (including sensory integration observation and process observation), and interviews. The findings of the study reveal that: (1) the teacher and the participants possess positive attitude toward applying webcam motion sensor games to sensory integration training; (2) Webcam motion sensor games can enhance autistic students' learning interest; and (3) applying the game-based learning to webcam motion sensor games can improve the effect of autistic students' muscle training and endurance.

1. RESEARCH MOTIVES AND PURPOSES

According to the Ministry of Interior (2011), the census data on the numbers of physical or mentally disabled people show that there were 11,211 autistic patients in Taiwan, and the autism was in second place (4,118 people) among 6 to 11 year old students with physical and mental disabilities. Since autistic patients have difficulty in interpersonal interaction, some people call them "star students." Up-to-date, there is no single method that can fully cure autistic students. In traditional training methods, many game methods are carried out by teachers in individual instruction, learners still cannot actively participate in learning, resulting in shortened learning time, lowered learning intentions, insufficient training obtained by learners, and poor levels of accommodation. Also, current developed methods include drugs, educational therapy, art therapy, and associated new supportive methods of treatments. Among them, the sensory integration training is a very important method of learning in educational therapy. Yu (2006) proposed that the sensory integration training can make up for the shortcomings of brain function, enhance the coordination between senses and perceptions, improve the physical growth and development, and establish the foundation for abilities needed in later social life, which allows autistic patients to exercise and engage in limb training, elicit vestibular sensation, tactile senses, and stimulation to the individual, achieving the purpose of coordinated development of feelings and perceptions.

Additionally, recent development in advanced technology has led information technology to produce support systems, so that training methods have become more diverse. Also, rapid development in human-machine interfaces has produced many new products, such as touchscreens, voice-controlled systems, eyeball tracking systems, and so on. Among them, the motion sensor games, such as wii and kinect have also been developed to make human-machine interfaces highly popular. The concept of game-based learning has constantly been discussed by experts and scholars in the past years. Thus, how to incorporate motion sensor games with training for autistic students in order to improve learner's needs has become an important issue. As a result, the purpose of this study aims to explore the effect of applying game-based learning to webcam motion sensor games for autistic students' sensory integration training.

2. LITERATURE REVIEW

2.1. Autism and sensory integration

Autism is a developmental obstacle caused by abnormal brain function, which usually manifests before three years of age, often accompanied with mental disability, epilepsy, hyperactivity, reclusion, and acting out. Students with autism have three major obstacles in daily life: interpersonal relationship problems, language and expression problems, as well as behavioral problems (Wikipedia, 2012). In the past year, several studies on education and treatment of autistic students, such as game treatment, art treatment, drug treatment, behavioral modification technology, CAI computer assisted instruction, sensory integration, and structural instruction (Special Education Knowledge Web, 2012) have been conducted with the purposes of training students' focus on concentration, emotional stability, and physical coordination. Related studies have shown that the action and sensory integration problems of autistic students are summarized in the three following factors: (1) difficulty in visual space; (2) difficulty in kinesthetic sense; and (3) difficulty in actions that require multisensory integration. Training of sensory integration uses suitable activity stimulation to elicit ideal behavioral performance. In environments with greater structure, autistic students would also have better learning performance.

Sensory integration is the organization and integration of different feelings transmitted by various nervous systems in the brain steam, allowing the different parts of the central nervous system to work together, so the individual can smoothly interact with the environment, and has a sense of satisfaction (Chang, 2010). Additionally, sensory integration training evaluates the neural needs of students, to guide them in training for suitable responses for stimulation. Such training includes providing whole-body exercises that stimulate in vestibular system (gravity and motion), proprioception (muscles and feelings), and the sense of touch. Motor training is most common in sensory integration training, including motor training with many physical action elements, which can give the senses suitable stimulation and promote vitality of the brain's central nervous system (Hua, 2008). Ayres (1972) pointed out that students' sensory integration can proceed with vestibular senses, tactile senses, and proprioception. He also proposed that changes in sensory input should be combined with motor exercise, use limb movement to train and develop sensory integration ability. Thus, sports games should integrate limb movement into game design in order to naturally incorporate ways for students to move their bodies and achieve the objective of integrating sensory perception. For instance, Grandin (1986) used personal research to engage in interviews about the experiences of autistic patients. After integrating various academic papers, Grandin strongly suggested that teachers and parents should arrange sensory integration therapy for autistic students (Grandin, 1996). Furthermore, Chian (2007) suggested that action education training can develop basic sports ability and physical ability through activity, and they can learn through actions, including physical exploration of the surrounding environment, perceived motion ability, and conceptual and emotional development.

2.2. Game-based learning (GBL)

According to Yang (2010), game-based learning (GBL) can be traced back to well-known kindergarten scholar Friedrich Froebel, who asserted the importance of games and Froebel Gifts for students' learning. Also, educational psychologist Piaget proposed that games can help students learn and believe that in games, the assimilation effect is greater than the adjustment effect because games do not need players to change themselves or adapt to environments, but need to use games to repeatedly practice new techniques and become proficient (Wu and Guo, 2003). Ebner and Holzinger (2007) concluded that findings of using game based learning in higher education support the efficacy of game playing. Garris, Ashlers, and Driskell (2002) administered a digital game-based learning model to explain that when digital games are applied to learning with a process of learner input, process, and outcomes (Figure1). The input part includes instructional content (the course content and the core). Game characteristics refer to the fundamental elements in the game, such as competition, challenge, audio-visual, and animation. After the three internal cycles are processed, including the system feedback, user behavior, and user judgment, the learning outcomes will be produced, which match with the learning objectives.

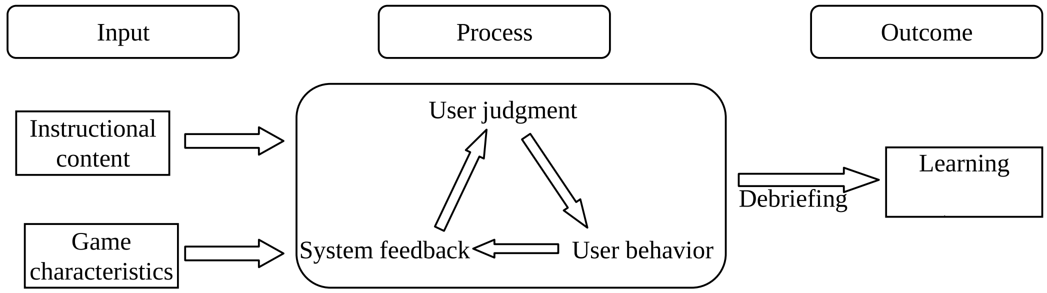

Figure 1 Digital game-based learning model (Source: Garris et al., 2002)

2.3. Research relating to motion sensor games

The development of new technology has produced various new tools, such as wii, wii-fit, and Kinect that might have replaced the traditional human-machine interface tools (mouse and keyboard). The basis of related applications is constructed on the module of human-machine interaction. Cognitive space originates in personal traits, experiences, and culture, in turn form physical space for interactive operations. In physical space, people use the control interface to control events, and in turn elicit interaction in virtual space. In virtual space, manipulation of events in physical space are used to compute and execute, combining with physical space to present the digital virtual interactive information for execution (Huang et al., 2010). Currently, popular motion sensor games such as wii and Kinect are used as major consoles, but wii requires users to hold the sensors, which may not suitable for some special groups (Ministry of Education, 2012). Chiang & Chen (2012) found wii somatosensory games can increase older adults functional physical fitness and social interaction, and to promote their quality of life by gaining fun and enjoyment. Also, Lin, Hong, and Chen (2010) found if used properly, Wii Fit Plus somatosensory games can improve health conditions such as heart rate, fat consumption, oxygen uptake, respiratory exchange ratio, and hand-eye coordination. Furthermore, Chang, Chen, and Huang (2011) found that the participants significantly increased their motivation for physical rehabilitation. Furthermore, Chin (2012) found Kinect sports can enhance youth sports participation motivation and promote health-related fitness. As a result, the researchers decided to employ webcam videoconferencing tool in this study because its technology is similar to that of kinect, but is relative cheaper, along with Sky game online game to conduct this study.

3. RESEARCH PROCEDURES AND IMPLEMENTATION

3.1. Research Method and Procedures

The research method in this study is a quasi-experiment case study. The analytical methods include physiological monitoring and interviews. At the beginning of the study, online Flash game resource http://webcamgames.sky.com/ was used to select games suited to the abilities and needs of subjects. The selection standards focus on four major directions (1) competitive: enhance the attention and participation motivation of subjects; (2) extension of major muscle groups: training major muscle groups is effective; (3) has muscle endurance training: can focus on major muscle groups of subjects for repeated training in order to enhance muscle endurance; and (4) difficulty should not be too high or too complex: although subjects are high-functioning autistic patients, the limb coordination is still insufficient, thus the training content should not be too fast or too complex. At the beginning of research, the three participants were told that it was a game and relax. Then their blood pressure and heart beat were measured followed by engaging them in testing and demonstration, explaining the connections between the camera, actions, and virtual space. Each time, three rounds of competition were conducted (about 10 minutes each round). Meanwhile, the teachers engaged in observation and recording, attempting to engage in intervention testing to understand the conditions of concentration. After the game, blood pressure and heart beat were measured again and then interview was conducted.

3.2. Research Subjects

Three autistic students from special education classes in southern Taiwan were recruited as the participants in the study. Student A’s symptoms are autism accompanied by ADHD, aged 8; Student B’s symptoms are autism accompanied by muscular dystrophy, aged 10; and Student C’s symptoms are autism accompanied by mental disability, aged 8. They have high-functioning learning abilities, and do not also have mental disability. The teachers are two female teachers with master’s degrees, who have been working in special education for 6 and 10 years.

3.3. Research Tools

3.3.1. Research tool

Webcam and motion sensor games were used as the experiment tools. Figure 2 shows the arrangement of the setting. Two meters squared of activity space is maintained in front of the equipment, with a total of four meter squared of sensory space was used to avoid disturbing the research testing process.

Figure 2 Research testing equipment arrangement and game interface

After the hardware and equipment are installed, the site http://webcamgames.sky.com/ is used to connect to the swimming race game with easy level of difficulty. Figure 3 shows the example entries of the websites. The interface of the swimming race game is shown in (a), with the pool lane of the subject; (b) shows the homepage of the game provider, including many types of motion sensor games conducted through the video cameras, such as ball-balancing game, and jumping game.

(a) (b)

Figure 3 Motion sensor games interface

Additionally, the mobile electronic blood pressure and heart beat monitor used for measurement in this study (Figure 4). The semi-structured interview tool was designed by the researchers, including the part for the teacher and the part for the students. The teacher portion consists of background data, usage feedback, and addition of special explanations; the student portion includes usage intention and feelings and special additional explanations.

(1) Teacher's semi-structured interview tool
- a. Teacher background contains 6 questions, including teacher's name, gender, seniority, identity (homeroom teacher, subject teacher), teacher education, and teacher profession (major).
- b. Usage feedback contains 3 questions, including the feasibility of usage in class, assistance for student learning, and intention for teacher usage.
- c. Addition of special explanations contains 2 parts, including the researcher's observation from the interviews and teacher's additional comments.

(2) Student's semi-structured interview tool
- a. Usage intention and feelings: "How do you like this game," "Would you like to use this method in class in the future?" "How does your body feel, is there any discomfort?
- b. Additional comments: recording the students' responses.

(3) Observation chart (observation records are made for physiological monitoring, limb coordination, race time, tempo/accommodation, and game performance). The researcher records and observes associated data while the autistic students playing the game.

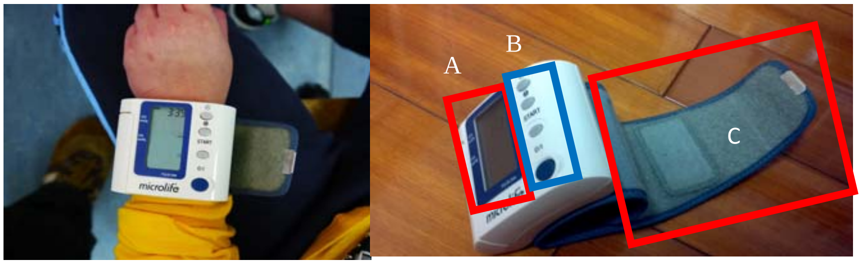

Figure 4 Mobile electronic blood pressure and heart beat motion

3.4 Data Analysis

The recording information is used for post-hoc research. Lin's (2007) four steps of data analysis flow in qualitative research were employed. They are 1) reading and organizing; 2) description; 3) classifying; and 4) interpretation. In order to enhance validity, this study used triangulation and the two classroom teachers (Lin and Hsu) to engage in simultaneous observation and recording for the same student. The researchers mainly focus on analyzing and comparing the three sets of records.

4. RESULTS

4.1Measurement of biological change

Biological change was used to measure the changes in heart beat and blood pressure when the three subjects undergoes 3 times of the webcam motion sensor game. The summary of statistical results is listed in Table 1.

Table 1 Biological change in the subjects before and after the game

Student	Test time	Heart beat (times/minute)	Blood pressure (systolic / diastolic)	Temperature
Student A	Before the game	90	119/77	36.7
	After the game	132(+42)	131(+22)/89(+12)	37.9(+1.2)
Student B	Before the game	83	108/68	35.6
	After the game	114(+31)	111(+3)/70(+2)	37.5(+1.9)
Student C	Before the game	92	112/71	36.4
	After the game	119(+27)	128(+16)/81(+10)	37.8(+1.4)

Table 1 shows that after 10 minutes of webcam motion sensor games were completed, the three autistic students showed an increase in heartbeat, blood pressure, and body temperature, indicating that even though motion sensor games only exercise major muscles in the upper limbs, after multiple repetitions, the movement back and forth also caused clear increases in heartbeat of the subjects. The reason may be because of nervousness over the competition, body temperatures also rose. As a result, the webcam motion sensor game is effective in enhancing cardiovascular function.

4.2. Observation records

Table 2 shows the observation records of the three subjects, including limb coordination, concentration focus time, tempo accommodation, game performance.

Table 2 Observation records of subjects

Item / Student	Limb coordination	Race time	Tempo / accommodation	Game performance
Student A	The whole body would shake from side to side, along with irregular shaking of the hands (at the same time, not alternately). Large range of large muscle movement, but there is a lack of coordination.	1.2m40s 2.3m01s 3.3m12s	1. Initially needs teacher assistance, motivating movement of major muscles, or there would be full-body twitching. 2. Excessive full-body movement may come from hyperactivity in ADHD. 3. Can listen to the water splashes in the game along with the speed. Movement fastest among the three. 4. Coordination is somewhat fair among vision, hearing, and motion, and would speed up movement when falling behind.	1st 1st 1st
Student B	Limb coordination is best among the three, has most correct and accurate action consciousness. Rotation range is smaller, may be due to insufficient muscle endurance.	1.3m39s 2.4m02s 3.3m32s	1. Rotation range is relatively small and slow. 2. Listen to the water splash sounds in the game to adjust speed. 3. Insufficient muscle flexibility, rotation speed needs improvement. 4. Increase rotation when falling behind.	3rd 3rd 2nd
Student C	Limb coordination is fair, unclear action consciousness, but has the ability to imitate, but the actions would sometimes change. Accurate rotation movement has the most correct posture of the three. Rotation speed is still slower.	1.3m05s 2.2m42s 3.3m35s	1. Initially, needs teacher assistance to trigger major muscle rotation. 2. After teacher demonstration, can complete the action. 3. There is insufficient sensitivity to visual and audio stimulation, and the teacher has to stand-by to tell student to speed up.	2nd 1st 3rd

In the motion sensor game process, the subject can adjust the speed of rotating limbs through seeing whether he is ahead or behind, and can use the splashing sounds to adjust the rotation speed. Generally, in the early times of limb coordination, the teacher needs to carry out more demonstrations, so the students can test and then carry out subsequent testing.

(a) (b) (c)

Figure 5 Photographs of actual testing

Figure 5 student A shows a smaller range for opening his left and right hands. Since student A has muscular dystrophy, his muscle is weak, and has relatively poor proprioceptive sensation, so that the stretching range is relatively small. However, the test results show that when the subject discovers that the speed is too slow, he would actively expand the rotation range. Student B shows the distance for "B," whose armpits are closer together, and the opening of arms is relatively smaller, and this may decrease the strength of the exercise as a result. Student C shows that the subject's distance with a relatively greater distance between hands, but there is still poor proprioceptive sensation. Student C also has hyperactivity, and would greatly swing the upper arm, but in a chaotic way, including back of the hand and shoulder blade both facing up, and the body axis would also move forward, showing the distance of "C," which indicates that while the student moves to a greater extent, in the three game tests, he knows to slow down and adjust hand movement. The above findings show that the motion sensor games would produce corresponding splashing noises (in loudness and splashing frequency) to the subject's movement (amplitude and speed), which enable the subjects able to integrate sight, sound, motion, and proprioceptive sensation.

Table 3 shows the sensory integration observation records of the three subjects. The determination refers to Huang et al.'s (2010) chart on poor proprioceptive sensation.

Table 3 Analysis of sensory integration observation

Item / Subject	Initial difficulties in sensory integration	Improvement objective	Exhibition of sensory integration improvement or actions
Student A	Show many actions that provide oneself with major amounts of stimulation (poor proprioceptive sensation-body concept). Insufficient action precision (poor proprioceptive sensation -action planning ability).	Lower excessive feedback for physical stimulation. Increase the precision of integrating sound, sight, and, proprioceptive sensation.	Action was stopped in two instances, and rotation began after re-adjustment. Rotation range slightly decreased the distance between hands.
Student B	Poor muscle endurance (poor proprioceptive sensation -body concept). Slow tempo of action (poor proprioceptive sensation -action planning ability).	Strengthen muscle endurance Assist in improving action range and frequency.	Arm raised by about 2cm (visual estimation). Improved action range. Still easily tired
Student C	Inability to flexibly extend (poor proprioceptive sensation). Frequent stubborn unconformity to teacher decisions (poor proprioceptive sensation -action planning ability).	Assist in physical flexibility. Guide him in becoming more agreeable.	Likes motion sensor games, conforms to teacher opinions, relatively higher degree of agreement. Still insufficient physical extension flexibility, but acted precisely about twice.

4.3. Teacher and the students' feedback

Both classroom teachers and students participate in testing, one of the researchers interviewed the subjects and their teachers. Since the students are not fully apt in expression, they express their thoughts through nodding, shaking their heads, or facial expressions. Table 4 shows the summary of the interview records.

Table 4 Summary of interview records

Identity	Feedback opinion	Note
Teacher Y	The class can deal with related hardware facilities. Students would certainly like the gaming method. It is hoped that training would still conform to functions. Teachers can use this game to understand student limb coordination. Generally speaking this is a quite good tool.	If the game can provide for teacher designs, it would be better.
Teacher Z	The equipment is cheap and easy to obtain. Can use this for physical training. Students like to play this way. Can see this as a positive reinforcement, and can be used	Hoping to include games involving balance and coordination, which can add full-body games

	for physical training. This is a game-assisted instruction that is worthy of promotion.	
Student A	Student expressed preference for this game. Student hopes to play a few more times. Students expressed that this was more fun than previous training. Student expressed having sore arms.	The student was eager to speak, and did not focus his attention. Even though he did not speak full sentences, the key vocabulary is still clear.
Student B	Student liked this game. Playing like this every day would be good. The game is not difficult Hands felt very sore. This is more fun than rehabilitation, would want to keep playing.	Student spoke words clearly, but sometimes the meaning was not clear.
Student C	Liked this game. Very sore hands (nod). Hoped to play every day (nod).	Student can mostly nod or shake head.

The above results show that three students and the teachers expressed that they liked this type of game. Both teachers and students believe that it is a type of instruction and not just a game. All subjects expressed soreness in arm muscles, indicating that the muscles are being trained. Also, in the game process, the three students had certain level of physical training. During the interviews, the teachers also pointed out that there is low demand for hardware and equipment for this type of game and it should be widely used. To conclude, the combination of vision, hearing, and physical movement in sensory integration is effectives and receives affirmation.

5. CONCLUSION AND SUGGESTIONS

The results of this study show that in terms of sensory integration training, the training of student sensory connections, including vision, hearing, motor senses, and overall coordination of limbs all show some positive changes in the observation process. In terms of physical ability training, including changes in heartbeat, blood pressure, and body temperature, as well as upper arm soreness of the students shows an effect on extending muscles, major muscle training and muscle endurance. The results are supported by Huang et al. (2009) findings in multimedia motion sensor game applications. On the whole, the teachers and the students possess positive attitude toward applying webcam motion sensor game for training autistic students' sensory integration and found it interesting. Additionally, the findings of the study show that GBL has a significant effect on learner motivation in instruction (Papastergiou, 2009; Rosas et al., 2003; Virvou, Katsionis, & Manos, 2005). Also, webcam motion sensor game can connect their physical actions to the virtual world, blurring the boundaries between the physical and the virtual, which can lower their need for abstract thinking ability, and in turn increase their level of participation. Studies related to the enhancement of learning motivation also show that different degrees of learning motivation would elicit learning effects (Mizelle, Hart, & Carr, 1993; Small & Gluck, 1994). As a result, the effect of applying webcam motion sensor game to and game-based learning for training autistic students' sensory integration is significant and effective.

6. REFERENCES

Ayres, A. J. (1972). *Sensory integration and learning disorders.* Los Angeles: Western Psychological Services.

Chang, S. J. (2010). Seniors' Sensory integration training discussion. *E-SOC JOURNA*, 85,14.Retrieved from ttp://www.nhu.edu.tw/~society/e-j/85/.

Chang, Y. J., Chen S. F. & Huang J. D. (2011). An Accelerometer-based Handheld System to Reduce Breaks in Performance of Young Adults with Cognitive Impairments. Research in Developmental Disabilities, 32(6), 2530-2534.

Chiang, I. T. & Chen, S. T. (2012). Health Benefits of Digital Somatosensory Ames for Older Adults. *Zhong Hua Ti Yu.* 26(1), 41-49. doi: 10.6223/qcpe.2601.201203.2005.

Chin, T. C. (2012). *The research of the influence of Kinect on teenagers with DCD's physical fitness.* Unpublished master's thesis. Taipei Physical Education College, Taipei

Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. *Simulation & Gaming, 33* (4), 441-467.

Grandin, T. (1996). Brief Report: Response to National Institutes of Health Report. *Journal of Autism and Developmental Disorders*, *26*, 185-187.

Grandin, T. & Scariano, M. (1986). *Emergence: Labeled Autistic*. CA: Arena Press.

Hua ,Y. H. (2008). *An Investigation of Teaching Methods Used with Students with Oppositional Defiant*

Disorder (ODD) and with Students with Autism (Unpublished master's thesis). National University of Tainan, Taiwan: Tainan.
Huang, C. H., Chang, W. H., Hsu, T. D., Liao, S. K. (2010). *Play Sensory Integration Games at Home at Ease.* Taipei City: Cite Publishing.
Huang, M. C., Liu, M. N., Kuo, Y. H., & Huang, S. C. (2009). Using Computer Visual Development and Motion Sensor Interactive Games as Multimedia Instructional Materials for Autistic Students in Elementary School. *Journal of Ergonomic Study, 10*(2), 1-10.
Lin, M. Y., Hong, W C. & Chen, H. C. (2010). Effects of Somatosensory-Style Video Games on Health and Pedagogy. *The University Physical Education & Sports,*110, 61-67.
Lin, S. C. (2007). *Education Research – Comprehensive Integration and Analysis*. Taipei: Psychological Publishing.
Ministry of Education, Taiwan (2012). *Plan for Happiness.* Retrieved on June 4, 2012: http://www.btree.com.tw/display02/upfile/file/%E6%95%99%E8%82%B2%E9%83%A8-%E5%BF%AB%E6%B4%BB%E8%A8%88%E5%8A%832.pdf.
Ministry of Interior, Taiwan. (2011). *Statistics on Numbers of Physically and Mentally Disabled.* Retrieved on April 28, 2012: http://www.moi.gov.tw/stat/.
Mizelle, N. B., Hart, L. E., & Carr, M. (1993). Middle grade students' motivational processes and use of strategies with expository text. *Annual Meeting of the American Educational Research Association*, Atlanta, GA, April 12-16, 1993.
Papastergiou, M. (2009). Digital game-based learning in high-school computer science education: impact on educational effectiveness and student motivation. *Computers & Education, 52* (1), 1-12.
Rosas, R., Nussbaum, M., Cumsille, P., Mareanov, V., Correa, M., and Flores, P. (2003). Beyond Nintendo: Design and assessment of educational video games for first and second grade students. *Computers & Education*, *40* (1), 71–94.
Small, R. V., & Gluck, M. (1994)
. The Relationship of MotivationalConditions to Effective Instructional. *Educational Technology, 36* (8),33-40.
Special Education Knowledge Web (2012) .*Characteristics and Treatment of Autism*. Retrieved on April 20, 2012: http://blog.xuite.net/topnet32/stwotp?st=s&w=%E8%87%AA%E9%96%89%E7%97%87&p=3.
Virvou, M., Katsionis, G., & Manos, C. (2005). Combining software games with education: Evaluation of its educational effectiveness. *Educational Technology & Society*, *8*(2), 54-65.
Wikipedia (2012). *Autism*. Retrieved on April 28,2012.
http://zh.wikipedia.org/zh-tw/%E8%87%AA%E9%96%89%E7%97%87.
Wu, H. L. & Guo, J. H. (2003). *Playgroup: the theory and practice of game development*. Taipei: ALi.
Yang, C. D. (2010). *Group Counseling: Theory and Practice (New Edition).* Taipei: Wu Nan.
Yu, H. Y. (2006). *Education and Treatment of Autism.* Retrieved on April 28, 2012: http://www.autism.hk/asd/asd_therapy.htm.