A Preliminary Investigation:
Potential of Interactive Multimedia Learning Awareness (IMLA) in Enhancing Awareness of Autistic Characteristics among Parents and Society in Malaysia

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Abstract – In this article, we report the feedback from respondents in relation to the implementation of Interactive Multimedia Learning Awareness (IMLA) in enhancing awareness of autistic characteristics among parents and society in Malaysia. Methods of gathering information such as observation and interviews were used in order to identify the current level of awareness towards autistic children. Nine respondents were selected to participate in this interview ranging from two content experts from the National Autism Society of Malaysia (NASOM), a researcher who is also an expert in autism from Universiti Kebangsaan Malaysia (UKM), a mother with autistic children, a mother without autistic children, two parents without autistic children and three unmarried women. The findings of this preliminary investigation confirm that there is a lack of awareness that needs to be addressed by Malaysian society. As a conclusion, the implementation of Interactive Multimedia Learning Awareness (IMLA) needs to be designed and developed to facilitate and to enhance the awareness of autistic characteristics in Malaysia.

Keywords – multimedia; learning; awareness; autism

I. INTRODUCTION

Autism is a development disorder characterized by impairments in three areas (communication, social, and limited imagination) resulting in very narrow interests and repetitive behaviours. Autism was first described by American psychiatrist Leo Kanner in 1943, and is thought to result from a brain disorder that takes place during the first two and a half years of childhood. It is characterized by social disconnectedness, failure to recognize and read the subtleties of human communication behaviours and interactions, an obsessive addiction to routines and repeatable behaviours, and what psychiatrists call meaningless no contextual echolalia, the repetitions of sentences and words without regard to their significance or the context in which they are spoken. The five main areas of autism and their differences are shown in Table 1 [17]. Although autistic children may look normal, autism causes them to experience our world very differently.

Table 1. The different types of autism

<table>
<thead>
<tr>
<th>Types</th>
<th>Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Autistic disorder</td>
<td>Markedly abnormal or impaired development in social interaction and a markedly restricted repertoire of activity</td>
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</tbody>
</table>

People who could not understand them often see them as selfish, slow, distant and odd. There are lonely, yet they find social contact disturbing. Lacking the social instincts of caring, sharing and pretending, they do not play, chit-chat and make friends. Because autistic children are never certain of what is happening, they cannot make choices or express themselves. These scenarios will lead to the wrong perception towards this group if no proper awareness or intervention efforts are made. This can lead to a burden, especially to parents if they do not have basic awareness of autism symptoms.

Mansor [8] indicated that in view of the lack of knowledge and exposure – especially in Malaysia – autism is often misconstrued as a mental illness. Consequently, these children are mostly kept at home, hidden from the outside world. Due to this, most of them do not have the opportunities of others such as obtaining education, which is a basic human right, and access to health care; hence we must take that decisive step forward to educate society on autism. Parents need to be taught the symptoms to look out for if they suspect their children could be suffering from autism. They also need to be assured that it is neither the end of the road nor are they alone if their child is diagnosed as being autistic. At the same time, their autistic children need encouragement to

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take care of themselves so that they are able to contribute well to society in the future.

Awareness is the state or ability to perceive, feel or be conscious to objects or sensory patterns. In this state, sense data can be confirmed by an observer without necessarily implying understanding. More broadly, it is the state or quality of being aware of something. In biological psychology, awareness is defined as a human’s or an animal’s perception and cognitive reaction to a condition or event [2]. Awareness is a relative concept. An animal may be partially aware, may be subconsciously aware or may be actively aware of an event. Awareness may be focused on an internal state, such as a visceral feeling, or external events by way of sensory perception. Awareness provides the raw material from which animals develop subjective ideas about their experience.

Morin [11] refers to self-awareness as the capacity to become the object of one’s own attention. It occurs when an organism focuses not on the external environment, but on the internal milieu; it becomes a reflective observer, processing self information. The notion of ‘level of consciousnesses has been around for quite some time. More than a century ago, two of the most influential theorists in psychology were already examining this notion - Sigmund Freud (1905) with the unconscious, preconscious and conscious, and William James (1890) with the physical, mental and spiritual selves, and ego.

Awareness can be enhanced by using suitable technology. The invention, use and continuous improvement of tools and utilities set man apart from other species. In basic terms, technology is nothing more than the practical application of knowledge to a particular area. Technology previously used in helping autistic children are too difficult or technical for average parents to understand and implement. The approaches are generally toward the autistic child and not toward the awareness of the parents. Some of the past and current approaches are listed in Table 2 to show how technology has been used to help autistic children.

Considerable effort has gone into the exploration of technology to aid in diagnoses and treatment of the disease, resulting in remarkable tools and methods that not only have the potential of improving the everyday life of an autistic person but may also answer some of the open questions about the nature of the disease. Though a lot of work is done by researchers around the world to increase awareness of autism in society – based on a Preliminary Investigations (PI) conducted – we found that the majority of respondents do not have even basic knowledge about autism.

The majority of them do not understand about autism in general and how to recognize the symptoms. Some of the feedback stated that there are reasons for this as a lack of knowledge, awareness given by the authorities was not enough, level of education, lack of expertise, facilities etc. So the lack of awareness is the main domain that needs to be tackled and a viable approach is using ICT or multimedia learning. Multimedia learning is the process of learning – usually in a classroom or similarly structured environment – through the use of multimedia presentations and teaching methods [20].

<table>
<thead>
<tr>
<th>Video</th>
<th>Imaging</th>
<th>Assistive Technology</th>
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<tbody>
<tr>
<td>Home Video Recording</td>
<td></td>
<td></td>
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<tr>
<td>- (Maestro, Casella, Milone, Muratori, &amp; Palacio-Espasa, 1999)[7]</td>
<td>- A child’s behaviour is observed</td>
<td>- Allows some analysis of the structure and functioning of what is perhaps the most difficult to analyze part of the brain.</td>
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<td></td>
<td>- Intelligence and language testing</td>
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<td></td>
<td>- Neurological and medical examinations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Weaken a clinically established diagnosis</td>
<td></td>
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<tr>
<td>Magnetic Resonance Imaging (MRI)</td>
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<td></td>
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<tr>
<td>- (Maestro, et al, 1999) [7]</td>
<td></td>
<td></td>
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<tr>
<td>Pictorial Information</td>
<td></td>
<td></td>
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<tr>
<td>- (Pierce &amp; Schreibman, 1994)[12]</td>
<td>- Children with autism tend to process visual information easier than auditory information. Especially pictorial information has been shown to be highly effective.</td>
<td></td>
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<tr>
<td>Voice Output Communication Aids (VOCAs)</td>
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<td>- (Scheips, 1998) [15]</td>
<td>- These devices produce synthetic or digitized speech when a symbol is selected from the VOCAs display and have been found to be easily adopted by autistic children. They exhibit great potential for generalization across settings and encourage the use of gestures, words and vocalizations.</td>
<td></td>
</tr>
<tr>
<td>Virtual Reality – SANDBOX TECHNIQUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- (Lowenfeld, 1939) [6]</td>
<td>- Is a psychotherapy technique employed for neurosis but also for autism. Patients are asked to play with a small sandbox, making a round shape with sand and placing various available figures into the created landscape.</td>
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</table>

This can typically be applied to any subject and generally any sort of learning process can either be achieved or enhanced through a careful application of multimedia materials. Multimedia learning also can be defined as the delivery of instructional content using multiple modes that include visual and auditory information and learner use of this information to construct knowledge.

Multimedia learning occurs when people build mental representations from words (e.g. spoken or printed text) and pictures (e.g. illustrations, photos, animation, or video) [10]. Mayer [10] added that the multimedia principle epitomizes the rationale for studying multimedia learning. There is reason to believe that, under certain circumstances, people will learn more deeply from words and pictures than from words alone. Mayer also explains how we process information through two basic channels, i.e. verbal and visual. Many people assume that multimedia is obviously better because it uses both channels. He also claimed that the most straightforward approach to multimedia learning is technology centred. Technology-centred approaches begin with the functional capabilities of multimedia and the focus is generally on cutting-edge advances in multimedia technology. Shank [18] listed some of the benefits of multimedia in learning...
that could be helpful in enhancing awareness towards autistic children. These include:

- Alternative perspectives
- Active participation
- Accelerated learning
- Retention and application of knowledge
- Problem-solving and decision making skills
- System understanding
- Higher order thinking
- Autonomy and focus
- Control over pacing and sequencing of information
- Access to support information

Researchers have found that multimedia could help people learn more easily because it appeals more readily to diverse learning preferences. So this research will help young couples, parents and society in general to learn the characteristics of autistic children as early as possible so proper steps for an early intervention can take place. The use of Interactive Multimedia Learning Awareness (IMLA) should be utilized to facilitate this process.

II. FINDINGS

The findings below are based on our literature review and preliminary investigation through observation and interviews.

A. Literature Review

Lately in Malaysia, there has been a considerable increase in the efforts toward improving the awareness of autistic children. The National Autism Society of Malaysia (NASOM) revealed that, in Malaysia, awareness of autism has increased in the last few years but more research is needed to assess the situation and to draft an efficient support system to address it [1]. The increasing numbers are based on cases reported and parents coming to seek help.

Autism Society of America (ASA) estimated the cost of US$80,000 (RM251,075) a year for average parents to look after an autistic child. Broken down, this amounts to US$6,666 per month (RM20,992). This figure covers the cost of treatment such as early intervention, physiotherapy, behavioural therapy and others. It does not include costs like transport, house rental, food and schooling for their other children. Approximately 35 million people worldwide are said to be affected by autism. A local survey conducted a few years ago revealed that one in every 625 Malaysia children is autistic.

Melaka Tengah Autism Association (MTAA) revealed that autism is treatable and early intervention is crucial [5]. Lai [5] added that parents should be aware of warning signs and symptoms of autism so that they can bring their child in for diagnosis, and follow up with the necessary treatment right away. They should not wait and expect the child to catch up later or outgrow the problem. The more they know about autism spectrum disorder, the better equipped they will be to make informed decisions for their child.

B. National Autism Society of Malaysia (NASOM)

Two content experts from the National Autism Society of Malaysia (NASOM), Kuala Lumpur, were interviewed and they confirmed that the lack of relevant knowledge in Malaysian society is the main reason for autistic children being left out. There are a few causes that contribute to this such as lack of awareness, lack of related research in this area, level of education, lack of facilities provided by government and high cost. They also mentioned that awareness is a continuous process that every member of society should take into consideration. The information provided by the government is not enough even though there are some funds provided by the Ministry of Women, Family and Community Development, they should also spread information and continue the efforts in educating society towards autistic children.

Mainstream media such as television can also help society tremendously by spreading the message through documentaries and dramas. New media approaches such as the Internet, Facebook and Twitter can also be used to persuade teenagers (especially) to know more about this syndrome. ‘New media’ is a broad term in media studies that emerged in the later part of the 20th century to encompass traditional media – such as film, images, music, the spoken and written word – with the interactive power of computer and communications technology; most importantly the Internet. The flexibility of the Internet in providing interactive access to a digital world is important to learners. The implementation of IMLA in Web-based interactivity will generate the benefits shown in Table 3.

Table 3. The benefits of the Internet

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Characteristics</th>
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<tbody>
<tr>
<td>High Impact</td>
<td>With a potentially sensual and compelling interactive experience through the use of the spoken word, animation, graphics and video.</td>
</tr>
<tr>
<td>Freedom of choice</td>
<td>Learners like to feel in control and not be forced down a particular route.</td>
</tr>
<tr>
<td>Usefulness</td>
<td>Learners value quality information delivered in a properly organized and easily understood fashion.</td>
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<tr>
<td>Instant availability</td>
<td>From the desktop PC, laptop or even Pocket PC or iPad.</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Which is doubled by using sight and sound, compared to sight or sound alone, as in old media.</td>
</tr>
<tr>
<td>Appropriateness</td>
<td>The ability to deliver as much or as little information as the user requires in order to be convinced.</td>
</tr>
<tr>
<td>Expandability</td>
<td>New parts can be added, or old areas amended with reasonable ease.</td>
</tr>
<tr>
<td>Self-paced</td>
<td>Computer-based training and interactive learning allow each learner to work at their own pace.</td>
</tr>
<tr>
<td>Just-in-time</td>
<td>New media learning is available when required.</td>
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</tbody>
</table>

At kindergarten and school level, government can provide more teachers that have the skills to recognize autistic children so that these ‘slow’ students can be more

J. Dolah, W. A. J. Wan Yahaya and T. S. Chong, Potential of Interactive Multimedia Learning Awareness (IMLA) in Enhancing Awareness of Autistic Characteristics among Parents and Society in Malaysia
easily identified. The lack of expertise at local hospitals should also be improved as most of the government hospitals and clinics do not have doctors who are specialized in autism. At this moment, there is no standard methodology in detecting autism. Every centre uses different techniques in diagnosing autistic children.

C. An Expert in Autism

An expert from the Intervention Unit of School of Education, Universiti Kebangsaan Malaysia (UKM), agreed that awareness plays a vital role in helping autistic children get fair treatment from the community. She added that the current awareness of autism is very low because the current model of disability in Malaysia – i.e., the way disability is treated in Malaysia – is through the means of a medical module (it can only be handled by a medical fraternity). In other words, if there is a disease, a physician will take address the issue. In Malaysia, if someone has autistic children then it is a personal or family issue. This is apparently without realizing that the issue needs to be addressed by society as well. There are even cases where some parents with doctorate-level education thought that early intervention is useless because nothing much can be done. People with disabilities tend to be seen as not beneficial to the economy. The expert also added that current information and facilities are very hard to find. For most families with dual income, one parent usually has to resign in order to provide full care for their autistic children. The cost (e.g. for a therapist), however, remains the same.

D. A Mother with Autistic Children

A mother with autistic children agreed that the awareness about autism children is still very low. For example she only realized that her children are autistic after 3 years of age when they were actually diagnosed. Before that she just read article on the Internet, books and magazines. In terms of facilities and support ,they are found to be insufficient. This is likely due to inadequate research done in this area. The majority of people still do not really know the needs of autistic children. Every autistic child has the potential to become a normal person if proper help and guidance been given to them. Research in visual support will probably have big impact but this project needs to be done in stages so that the child can follow it gradually. So far, nothing similar to multimedia learning could be found where parents can learn, and at the same teach their child how to communicate.

E. A Mother without Autistic Children

She admitted that she does not have proper knowledge about autism but knows a little bit through movies and magazines. According to her, autistic children are slow, like to be alone and not as active as normal children; but maybe they have extra capabilities in their own world. She also agreed that there is no system or method that can help to recognize the characters of autistic children.

F. Fathers without Autistic Children

Two fathers without autistic children admitted that they are not sufficiently aware about autistic children and that this needs to be remedied. Their assumption was that the majority of people in society, like them, do not have adequate knowledge of the matter. They were also not sure what autism is and the characteristics that autistic children have. They acknowledged that these children need special attention from society and must be treated fairly. Most parents will feel ashamed and cannot accept the fact they have children of this kind.

They commented that the information provided is insufficient and too clinical to be understood by the layman. Support from the authorities is lacking and campaigning efforts are very rare. Since these fathers do not have any children with autism, they are not all that bothered to know much more.

G. Young Women

The two young women interviewed admitted that they did not have any information at all regarding autistic children but like all the others, they agreed that awareness needs to be increased to educate the society on the matter.

III. LEARNING THEORIES

A. Awareness

In order to address the lack of knowledge, parents of autistic children need to be aware of the general symptoms of autism. Awareness implies knowledge gained through one’s own perceptions or by means of information. There are three processes involved in order to achieve awareness as stated here: perceive, identify and relate. These will lead to perceptions which include feelings, emotions, seeing, watching and making distinctions without judgment or reaction towards surroundings. As stated in [16], the study of self awareness is traced by Shelley Duval and Robert Wicklund where, at a given moment, people can focus attention on the self or on the external environment. When self-focused, people compare the self with standards of correctness that specify how the self ought to think, feel and behave. The process of comparing the self with standards allows people to change their behaviour and to experience pride and dissatisfaction with the self. The sense of awareness is important in learning characteristics of autistic children since it is related to the cognitive load theory of human as mentioned below.

B. Cognitive Load Theory

Cognitive load is a term that refers to the load on working memory in the human brain during instructions. Instruction may be aimed at teaching problem-solving, thinking and reasoning skills. People learn better when they can build on what they already understand (known as ‘schema’) but the more a person has to learn in a shorter amount of time, the more difficult it is to process that information in working memory.
C. Constructivist Learning Environment

In relation to cognitive thinking, to develop effective learning instructions requires an effective learning environment. Constructivism learning is a theory of knowledge that humans generate knowledge and meaning from an interaction between their experiences and ideas. Jonassen [3] proposed a model for designing a constructivist learning environment. Since the epistemological belief of constructivism is that knowledge cannot be transmitted, the design places emphasis on providing learning experiences that facilitate knowledge construction (creating ‘meaning’). In the constructivist learning environment, learners are encouraged to engage exploration, articulation and reflection; and the instructor will encourage by providing instructional support.

D. Behavioural Changes

In order to motivate people to learn certain instructions, certain human behaviours need to be studied. As stated in Toh [19], Prochaska [13] identified stages of behavioural change in a model that deserves consideration by instructional designers. The ‘Stages of Change’ model postulates that there is a course of successful change comprising of six well-defined stages, namely: pre-contemplation, contemplation, preparation, action, maintenance and termination. Each stage has specific tasks which must be completed before moving on to the next stage. Most interestingly, the model claims that changes cannot be skipped for successful, sustained changed. Each stage requires different kinds of activities and achievements before one can successfully progress.

E. Elaboration Theory

In developing a learning instructions project, the style and level of instruction needs to be constructed in sequence. ‘Elaboration theory’ introduced by Reigeluth [14], is a strategy for conceptual presentation where concepts are organized and presented in increasing complexity. Instructions should be organized in increasing order of complexity for optimal learning. For example, when teaching a procedural task, the simplest version of the task is presented first; subsequent lessons present additional versions until the full range of tasks are taught.

F. Motivation Theory

After the completion of the learning process, the learner will get a feel of how multimedia learning can motivate them and will be more aware of the symptoms of autistic children in future. As stated in Keller [4], motivational design consists of a set of categories of motivational concepts and strategies that are derived from a synthesis of the research on human motivation, combined with a review of successful motivational practices.

According to Keller, there are four major categories of motivational strategies that can help learners to increase motivation. These include: attention, sensory stimuli, inquiry arousal (thought provoking questions), and variability (variance in exercises and use of media).

G. Personalization Principles

The success of instructional design in this research will depend solely on the use of multimedia principles. In this study, the personalization principle will be used as the main independent variable to increase awareness on symptoms of autism. Mayer defined the multimedia principle as an approach where people learn better when multimedia messages are designed in ways that are consistent with how the human mind works and with research findings. The use of Mayer’s personalization principles in this research is related to the theory of behaviour of change (Prochaska) in terms of building up the relationship of how human behaviours react toward learning.

This change of behaviour is crucial in motivating the learner to take precautions in identifying the symptoms of autistic children. Normally, learning instruction is designed in a formal way and the information presented to the learners is too formal. Under this theory, two personalization principles will be used as independent variables; they are informal conversational and visible author. Personalization principles are effective when processes to create or select e-learning courses that include some spoken or printed text (that is conversational rather than formal) are involved. According to cognitive theories of learning, humans strive to make sense of presented material by applying appropriate cognitive processes.

People work harder to understand material when they feel they are in a conversation with a partner rather than simply receiving information. In other words people will be more comfortable when the information received came from a source that is not too formal and they feel comfortable adapting to the source. Instructional information is often written in a formal style in which the author is ‘invisible’. Invisible authors do not tell anything about themselves, whereas visible authors reveal information about themselves and highlight their personal perspectives. The rationale of using this principle is to promote the learner’s motivation as mentioned in the theory of ARCS by Keller (used in the theoretical framework). So the use of personalization principles in this research will likely increase the interest of parents to learn the characteristics of autistic children in their own time and continue efforts guiding their autistic children.

IV. THEORETICAL FRAMEWORK

The formulation of above learning theories and multimedia principles will lead to the theoretical framework that will be implemented into this research. The framework as proposed (see Figure 1) explains the structure and expected outcome of the research.

The theoretical framework will be based on the macro and micro strategies. Under the macro strategy, the combination of related theories will be applied in order to strengthen the researchers’ assumption on awareness; this can be achieved by using personalization principles. Under the personalization principles, there are two sub-categories (visible author and informal conversational)
which will be implemented as the independent variables in this research. The selection of these two variables is based on the theories of Keller and Prochaska where human motivation can be increased if they are following the right technique and theories. These two variables will be used to achieve the dependent variable of perceived awareness, perceived motivation and cognitive load. In order to achieve this, the selection of age and gender will be used as moderator variables.

![Diagram showing theoretical framework of Interactive Multimedia Learning Awareness (IMLA)](image)

The expected outcome from this research will be an increase in perceptiveness and motivation, especially for parents in identifying the early symptoms of autism. The implementation of this theoretical framework is important because it will map all the relevant theories and multimedia principles together to form a solid pathway for the development of Interactive Multimedia Learning Awareness (IMLA). This would validate the researchers' hypothesis that certain learning theories and multimedia principles can increase awareness in this regard. The selection of learning theories and multimedia principles in this research was done carefully in order to achieve the best outcome for the targeted group.

V. IMPLEMENTATION STRATEGY

A. Testing Strategy

The implementation of IMLA as shown in Table 4 will be done via three main phases. The initial treatment is during pilot testing where the autism spectrum quotient (ASQ) will be used in order to find out the level of basic knowledge regarding autism characteristics. The purpose of this testing is to check the sampling strategy, adequacy of data collection instruments, procedures, timing, adequacy of data analysis techniques and general feasibility. The feedback gathered from the pilot test will be used in the actual testing (IMLA) but in this stage the sample of target respondents will be bigger and the location will be wider. After the completion of the actual testing the motivational test will be applied in order to check the outcome from the pilot test and actual testing.

![Table 4. Research design](image)

B. Interaction Strategy

The implementation of these three treatments will apply certain interactivity strategies in order to increase the learners perception toward the objectives of the research. The interactivity refers to the facilities provided by a computer-based application to provide the user with both control of the process, and communication with content. In order to advance to the next level of the prototype, the learners will need to complete certain tasks before they can progress to another level. The prototype will use single-user interaction to engage users by displaying the content in a way which would attract users to spend more time on the prototype. The reason for this was because the needed to be completed in stages before learner can advance to the next level. Besides the use of interactive buttons and sound effects, this prototype will apply other interactivity features such as contact forms, polls, shoutbox, forums, and voting.

C. Navigational Strategy

A well-designed structure makes it easy to define the navigation system, and – combined with an effective visual design – enables the users to construct a mental map of the site. The prototype will be designed carefully in order to give learners an overall picture of the content, as well as help the user know the destination of each link. The use of a navigation bar, hyperlinks and sitemaps will be planned in detail (see Table 5).

![Table 5. Navigational strategy](image)
VI. CONCLUSIONS

Most of the feedback given by the respondents supported the suggestion made by Azizan [1] that, in Malaysia, awareness of autism has increased in the last few years but more research is needed to address the situation and to draft an efficient support system. It is hoped that our proposal of Interactive Multimedia Learning Awareness (IMLA) will be a viable alternative approach for parents to get to know the characteristics of autistic children, especially in the early stages.

The success of implementing IMLA will be based on specific learning theories and multimedia principles. The main objective of this research is to increase learner’s cognitive load, awareness and to also increase motivation. The formulations of suitable learning theories and multimedia principles will be used to design specific tools that help parents increase their awareness regarding autistic children. This work also will be suggested to Malaysia’s Ministry of Education to be used by the special education teachers in their classes. The system might be in web-based form so people can access the information everywhere.

Increased awareness is not something that we can achieve overnight since the characteristics of autistic children vary between children. With continuous research and support from various parties it will improve the situation. The role of multimedia learning is important in educating the society. With the advancement of ICT, such as multimedia learning, it will help society to learn, identify, recognize and consult with experts in less time than before. It will also reduce time spent, e.g. in seeing a psychiatrist, physician or therapist. Lastly, the continuous support from the government is necessary.

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