Application of The Multiple Intelligent Level Determination for Interest and Talent Development

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Abstract. This research focused on making applications to determine the dominant multiple intelligences. Everyone has eight different intelligences that reflect different ways of interacting with the world. The dominant multiple intelligence needs to be known so that the child's growth and development is in accordance with his or her talents and interests. Therefore, it is necessary to make an application with tools that have been tested by experts, which can determine the level of intelligence so that the potential of children can be developed. This application was created using the extreme Programming software development method. The reasons for the choice of this method were because the resources to create the application were readily available, the programming was conducted by a small team, and the application development time was short. This application used the PHP and MySQL by displaying a list of 24 questions that had to be filled out by the users. The application testing method used black box testing. The accuracy of the application was 100% from 150 respondents who used this application. The output of this application is a sequence of multiple intelligences owned by users ranging from linguistic, logical-mathematical, musical, spatial, kinaesthetic, intrapersonal, interpersonal abilities, and naturalist.

1 Introduction

The theory of multiple intelligences was delivered by Howard Gardner, professor and psychology of Harvard University for the first time, in his book which has title *frames of mine: the theory of multiple intelligences*. According to the book, Gardner said that every human has 8 different intelligences which is showed as the way they interact to the world that is linguistic intelligences, logical-mathematical, musical, spatial, kinaesthetic, intrapersonal, interpersonal abilities, and naturalist. This dominant multiple intelligences is needed to be recognize in order to make the child development suitable with child's talent interest.

Howard Gardner's theory of multiple intelligences has been hailed by educators for decades and applied in hundreds of schools worldwide. In Frames of Mind, Gardner

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challenges the widely held notion that intelligence is a single general capacity possessed by every individual to a greater or lesser extent. Amassing a wealth of evidence, Gardner posits the existence of eight different intelligences, each as important as the next, that comprise a unique cognitive profile for each person [1]. Gardner has discovered that human abilities are not perfectly correlated. Indeed, Gardner proposes that humans have talents in music, dance, and personal relations that are not measured by tests of vocabulary and block design. The psychological world is shaken by the revelation that the full range of human intelligence is not revealed by a single IQ score [2].

The research of the representation of multiple intelligences in the science textbook and the extent of awareness of science teachers at the intermediate stage of this theory had been done by Alsalhi in 2020. The criteria examined include eight of the intelligences from Howard Gardner's multiple intelligences theory. The study used the analytical descriptive method. The analysis found that the intelligences represented in the Science textbook were mostly verbal/linguistic, visual/Spatial, and logical/mathematical intelligence, with a combined percentage of 73.3 %. The other 26.7 % was distributed between the other intelligence types: interpersonal intelligence, intrapersonal intelligence, bodily/kinaesthetic intelligence, natural intelligence, and musical intelligence. The findings referred to moderate Awareness among science teachers about including the multiple intelligences in science textbooks, and there is no significant difference between their awareness according to gender variable. Vary depending on educational level (in favor of those teachers with Bachelor's level education), and depending on experience (in favor of teachers with more than 10 years' experience) [3].

Multiple Intelligences theory was one of the first formulations about intelligence to be based on neuroscience evidence. This research reviewed 318 neuroscience reports and extracted neural regions cited for the core cognitive components of each intelligence. This neural data was organized into four levels: primary regions, sub-regions, particular structures, and multi-regions per intelligence. Using descriptive statistics, the patterns of neural citations were compared and contrasted. This research conveys that in was determined there is robust evidence that each intelligence possesses neural coherence that is clear, distinct and aligned with accepted cognitive–neural correlates. Furthermore, these neural patterns are consistent with Gardner's 1983 hypothesis that general intelligence is most closely associated with the linguistic and logical-mathematical intelligences. Implications for using multiple intelligences theory as a bridge between cognitive neuroscience and instruction [4]. Multiple intelligences theory explores the idea that people learn and process information in different ways based on a combination of different areas of intelligence. In the areas of communication and education, this becomes important as a means to understand the listening process and creating class environments that offer instruction in more than just the typical linguistic or logical-mathematical areas of intelligence [5].

Actually, every intelligent person, human has intelligence dominance between the multiple intelligences. There is logical-mathematical dominant intelligence, and also there are linguistic or others. If we are able to approach our students based on the dominant intelligence potential it is going to make the talent interest accordance with the intelligence characteristic. This is in line with McCroskey and Chesebro statement that they delivered. "People can be intelligent in different ways". This is the premise of multiple intelligences theory as presented by Gardner. Because individuals have different intelligences, the natural extension of multiple intelligence theory is that people listen and learn in different ways, depending on each person's primary intelligence. As each person has his own unique blend of intelligences, each student then has his own unique way of learning [6].

"Design convergence talent" (DCT) refers to a person who is talented in creative-convergence design and possesses a degree in design or a related field. By analysing typical and distinctive characteristics of DCTs, this study explored the depth of intelligence-based

creativity. Creativity was assessed using the something About Myself (SAM) test, and multiple intelligences were rated using the Latent Ability Detection (LAD) test, on the basis of the multiple intelligence theory of Gardner. The results of this study offer a quantifiable basis for a DCT model as a means of creative-talent activation. At the industry level, the model may be useful for scouting and developing DCTs in order to establish a method of sustainable creation and innovative values [7]. Implementation effectiveness of multiple intelligence is shown in Applying multiple-intelligence approach to education and analysing its impact on cognitive development of pre-school children. This study aimed to find out multiple intelligence approach for education's impact on cognitive maturity of pre-school children. Applying MI approach in the classroom as a educational method results increasing in all five domains of pre-school children‘s cognitive development with 99% significance [8].

The using of this application is to decide the dominant multiple intelligences which is needed in order to make everything effective and efficient. This thing is going to help the child’s talent interest based on their intelligences When multiple intelligences theory is practiced with the benefits of technological tools, the implementation of multiple intelligences theory in educational communication across a wide variety of intelligences and learning levels emerges as the best way to communicate with and educate the most people in any educational environment [9]. This research is focused on application creation that has goal to decide dominant multiple intelligences quickly and easily so that the child’s potential can develop.

2 Method

Method of software development that is used for making Application of the Multiple Intelligent Level Determination for Interest and Talent Development is extreme programming (XP). This method was chosen because the source for making the system is available, time to develop short application, and programming is done by small team. The stage of XP method is shown in Figure 1 [10].

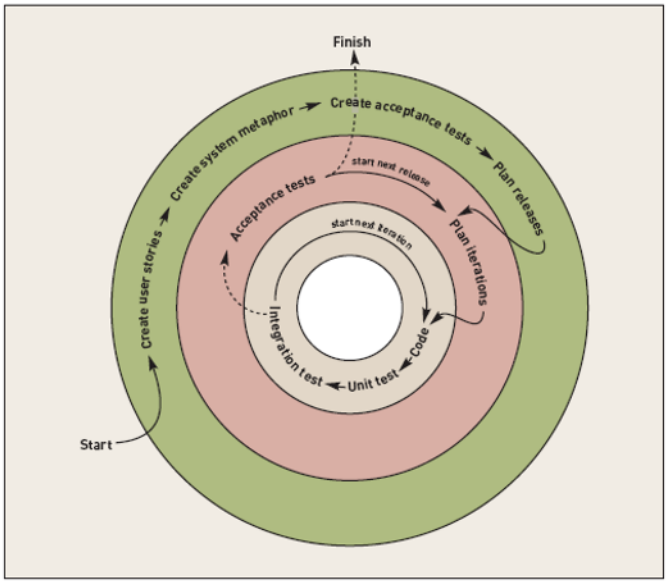

Fig. 1. XP development approach activities.

Activity level, system (outer circle) is system activity that happened once during the project development. The system is sent to the user in some stages which is known as release. Every release is functional system that is complete and it was from complete system requirements. A release is developed and tested in less than weeks or months. In this stage include user analysis and the making of use case in oriented analysis object to plan the release. Furthermore, the developer makes diagram class to present the object based on the need of the user. Next, developer and user make one set of acceptance test to every need of user analysis. If the acceptance test is considered complete, then the next step is making the development planning for release.

Activity level, release (middle part). Middle part activity is cycle multiple times once in every release. Release is divided to some iteration. Every iteration, the developer makes a code and do some functional specific test. Iteration is encoded and tested in days or weeks. First release is based on the first need of user and the next release is added with the need of other system specification. The first release activity was planning the series iteration. Every iteration focuses on small functional system which allow the developer to do code and test in few days which is integrated then. When all the release iteration has done, then the acceptance tests (release part level) begin. If the release fails, so the team back to the iteration level to fix it. If the release successes/ pass the acceptance test, so it is going to be sent to the final user and work starts on the nest release. If acceptance test from the final release is done, so the project development is done.

The third stage is iteration activity level (inner part). There are some iteration in every release, so that the inner iteration ring happens in some cycle. After iteration planning is done, the work starts on first iteration activity level. Code unit is divided among programming team and every team develop and test their own codes. XP recommend the first test approach to coding. The code test is done before the system is coded. When code module is done in unit test, then the next step is combining it into bigger unit to integration and test processes. When iteration pass the integration test, the work starts on the next release. When all the iterations are done, so acceptance test (release part level) is begun.

3 Results

Based on those levels, the stages that must be through are planning, design coding, and testing.

3.1 Planning

The planning test starts from contact the psychologist. After doing the discussion, they get the question information tools which has to be filled by the user to decide the artificial intelligence dominance for 24 questions that represent 8 intelligences: linguistic intelligences, logical-mathematical, musical, spatial, kinaesthetic, intrapersonal, interpersonal abilities, and naturalist. Question list is shown in Table 1.

Table 1. Question list to decide the dominance of multiple intelligences.

No	Question list
1.	I have sensibility in understanding someone's feeling and character.
2.	I am happy if I am involved in some helping job or proffesion for someone, such a teaching, counseling, and being a therapist.
3.	I am happy with harmony situation and tend to avoid some conflicts.
4.	I can influence some people to believe in what I believe in and what I am doing.
5.	I am confident in the middle of the crowd.
6.	I have an ideas, principal and being brave to express or deliver it to everyone.
7.	I have skill in using scissors, hammer, brush, pliers, needle, and others.
8.	I am expert in all physical activities such as sport, dance, or other games.
9.	I prefer study with direct practice rather than studying the theory only.
10.	I am confident to express myself and feeling with some writing or words.
11.	I am happy to read wherever and whenever it is.
12.	I am happy and I want to be fluent in many languages (foreign languages or local / cultural Indonesia language)
13.	My friends often ask my help to solve their counting problem and math.
14.	When facing some problems, I tend to use my logic and thinking analysis to solve it.
15.	I believe that all the things / incidents can be explained by scientifically and rationally.
16.	I like all music genre.
17.	My feeling is easy to get influenced when listen to some songs, music, or some holy verse (become happier / excited / sad)
18.	I am really easy to memorize song lyric and adjust the tone, rhythm, and song's intonation.
19.	I love to do some activities that related with livestock or pets or gardening or farming or fishery.
20.	I am interested in nature, plant and animal things.
21.	I can recognize and classify kinds of plant and animal
22.	I am able to explain what I imagine completely and in detail.
23.	I can read maps (google maps) well and correctly.
24.	I like drawing, painting, and sketch activity

3.2 Design

After through the planning stage, the next stage is designing. Designing here is include input design, process, output, and interface. The database design is shown in Figure 2.

Fig. 2. Designing table in application database.

3.3 Coding

The next stage is coding. This application uses programming language PHP. PHP is programming language that is suitable to use for developing dynamic web. This is because PHP is open source, easy to install, and it can be used for many operational system, include Microsoft Windows and UNIX. [11]. The Program snippets that are applied in this application is shown as:

Result calculation logic

```
  public function submit2()
    { $input = $this->input->post('jawaban');
      $data['nama']  = $this->input->post('nama');
      $data['usia']  = $this->input->post('usia');
      $data['ps']    = $this->input->post('ps');
      $data['mail']  = $this->input->post('email');

      $hasil = array(0,0,0,0,0,0,0,0);

      foreach ($input as $key => $value)
      { $hasil[$value['name']-1] += $value['value'];
      }

      foreach ($hasil as $key => $value) {
        $hasil[$key] = number_format((float)($value/12*100), 2, '.',
        '');
      }

      $keterangan = $this->M_post->saveHasil2($hasil, $data);
      usort($keterangan, array($this,'cmp'));
      if(!empty($data['mail'])) $this->sendMail2($keterangan,
      $data);

      echo json_encode($keterangan);
    }
function submitJawaban()
  { $('#part'+current).hide();
    $('#part'+current+'-line').addClass('bg-primary');
    $('#finish-bullet').addClass('bg-primary');

    $('#btn-prev').hide();
    $('#btn-fin').hide();
    var values = $("form").serializeArray();
    var nama  = "<?php echo $identitas['nama']; ?>";
    var usia  = "<?php echo $identitas['usia']; ?>";
    var ps    = "<?php echo
       (empty($identitas['ps'])?"":$identitas['ps']); ?>";
    var email = "<?php echo $identitas['email']; ?>";

    $.post("<?php echo base_url('survey/submit2') ?>", {
        jawaban:values,nama:nama,usia:usia,ps:ps,email:email },
        function( data ) {
        data = JSON.parse(data);

        var total = 0;
        $.each( data, function( key, value ) {
            if(key<8){
              $('#score-'+(key+1)).text(value.persen+'%'+'
```

```
        '+value.kategori);
      total += value;
    }
});
$('#total').text(total);

var k = data[0];
var m = data[1];
var s = data[2];
var p = data[3];

$('#kesimpulan').text(data[4]);

if(k>=13 && k<=20) $('#K1').removeClass().addClass('bg-
  primary text-white');
else if(k>=10) $('#K2').removeClass().addClass('bg-primary
  text-white');
else if(k>=7) $('#K3').removeClass().addClass('bg-primary
  text-white');
else if(k>=4) $('#K4').removeClass().addClass('bg-primary
  text-white');
else if(k>=2) $('#K5').removeClass().addClass('bg-primary
 text-white');
else if(k>=0) $('#K6').removeClass().addClass('bg-primary
 text-white');

if(m>=7 & m<=15) $('#M1').removeClass().addClass('bg-primary
 text-white');
else if(m>=6) $('#M2').removeClass().addClass('bg-primary
 text-white');
else if(m>=4) $('#M3').removeClass().addClass('bg-primary
 text-white');
else if(m>=3) $('#M4').removeClass().addClass('bg-primary
 text-white');
else if(m>=2) $('#M5').removeClass().addClass('bg-primary
 text-white');
else if(m>=0) $('#M6').removeClass().addClass('bg-primary
 text-white');

if(s>=7 & s<=17) $('#S1').removeClass().addClass('bg-primary
 text-white');
else if(s>=5) $('#S2').removeClass().addClass('bg-primary
 text-white');
else if(s>=4) $('#S3').removeClass().addClass('bg-primary
 text-white');
else if(s>=2) $('#S4').removeClass().addClass('bg-primary
 text-white');
else if(s>=1) $('#S5').removeClass().addClass('bg-primary
 text-white');
else if(s>=0) $('#S6').removeClass().addClass('bg-primary
 text-white');

if(p>=10 & p<=19) $('#P1').removeClass().addClass('bg-
 primary text-white');
else if(p>=7) $('#P2').removeClass().addClass('bg-primary
 text-white');
else if(p>=5) $('#P3').removeClass().addClass('bg-primary
 text-white');
```

```
        else if(p>=3) $('#P4').removeClass().addClass('bg-primary
         text-white');
        else if(p>=1) $('#P5').removeClass().addClass('bg-primary
         text-white');
        else if(p>=0) $('#P6').removeClass().addClass('bg-primary
         text-white');

    });

    $('#part-fin').show();
  }
```

Function send result

```
public function sendMail2($hasil, $data)
  { $this->email->clear(TRUE);
    $this->email->from($this->email->smtp_user,"Pribadimu.id");
    $this->email->to($data['mail']);
    $this->email->subject('Multiple Intelligence Analysis');
    $data['identitas'] = $data;
    $data['hasil']     = $hasil;
    $html = $this->load->view('/mailer/majemuk', $data, true);
    $this->email->message($html);
    $this->email->send();
  }
```

The interface homepage Application of the Multiple Intelligent Level Determination for Interest and Talent Development is shown in Figure 3. A simple Assessment is shown in Figure 4 which shows 24 questions that are divided into 3 pages. This question list must be filled by the user. The output page for the dominance of multiple intelligences is shown in Figure 5.

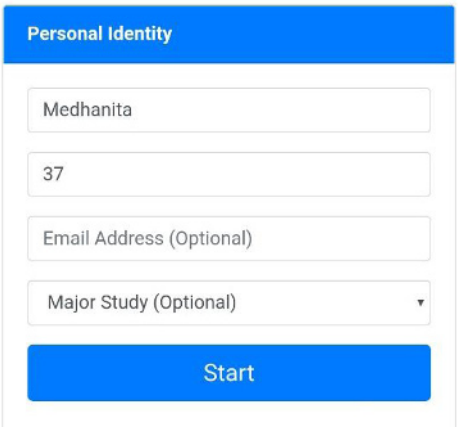

Fig. 3. The interface homepage application.

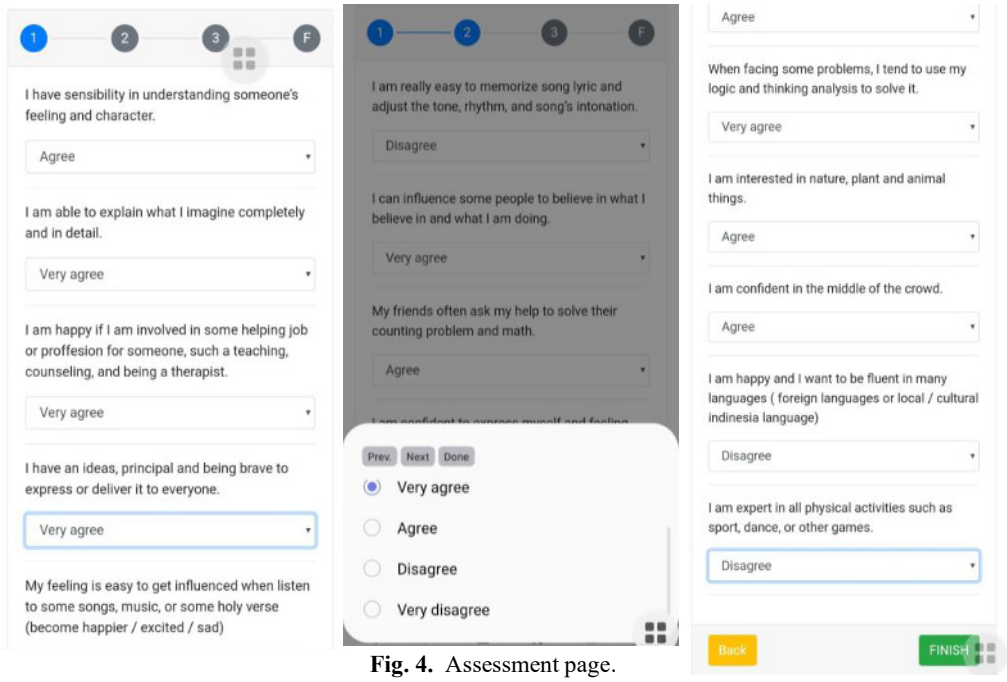

Fig. 4. Assessment page.

Each question contains four answer, namely very agree, agree, disagree, and very disagree. Output of this application is percentage score from each multiple intelligences. The display is sorted as descending like in Figure 5.

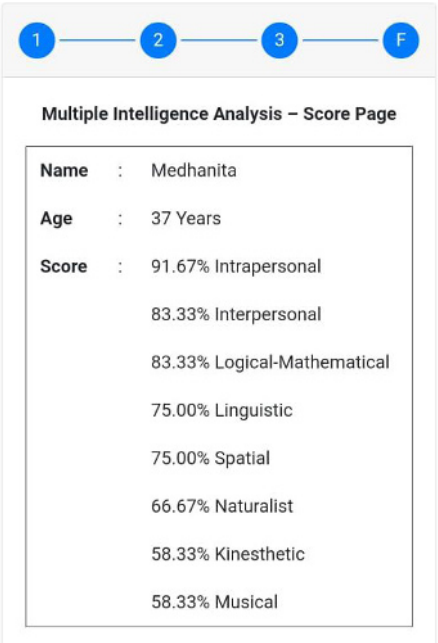

Fig. 5. The output page for the dominance of multiple intelligences.

3.4 Testing

The test stage is done by the application maker, psychologist, and user. The test is done by black box testing by making sure that the input and output which is resulted are suitable. Black box testing assesses a system solely from the outside, without the operator or tester knowing what is happening within the system to generate responses to test actions. A black box refers to a system whose behavior has to be observed entirely by inputs and outputs [12]. The test that is done include login feature, assessment filling process, and percentages multiple intelligences process, system accuracy is 100%, the result of classification uses paper filling suits with the application result for 150 respondents who are use this application.

4 Conclusion

The making of Application of the Multiple Intelligent Level Determination for Interest and Talent Development can be used by someone to decide his dominance of intelligence. The output of this application is a sequence of multiple intelligences owned by users ranging from linguistics, logical-mathematical, musical, spatial, kinaesthetic, intrapersonal; interpersonal abilities, and naturalist. This application is made by using programming language PHP and MySQL as Database Management System by showing 24 question list that must be filled by user. Accuracy of application is 100% from 150 respondents who have used this application. The existence of this application is expected to develop someone's potential based on his dominance of intelligences so he is more productive and creative suits to his interest and talent.

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