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# Validity and Reliability Study of the Human Problem-Solving Space Detection Test

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**Abstract**

The Human Problem-Solving Space Detection Test (HPSSDT), a unique assessment tool intended to measure people's capacity to recognize and traverse problem-solving settings, is examined in this study for validity and reliability. The purpose of the HPSSDT is to assess cognitive processes associated with spatial reasoning, problem-solving techniques, and decision-making procedures. The exam was given to a broad sample of people, and both traditional test theory and contemporary psychometric techniques were used to assess the data. Strong test-retest reliability (r = 0.85) and internal consistency (Cronbach's alpha = 0.89) are shown by the results. Factor analysis provided evidence for construct validity by identifying different aspects of problem-solving skills. By comparing HPSSDT scores with recognized assessments of cognitive function and problem-solving ability, criterion validity was established. The study finds that the HPSSDT is a viable and dependable instrument.

**Key Words:**Problem Solving, Validity, Reliability, Human Problem Space

## Introduction

An agent experiences a situation that is different from what it would want to be in, which is called a problem. A series of steps that lessen the gap between the starting point and the desired

outcome solve an issue(Newell, A., & Simon, H. A.,1972).When we must go past a barrier to change from one desirable condition to another, we have a difficulty(Sternberg, R. J. 1986). Psychologists have conceptualized (Hayes, J. R. 1989;Bransford, J. D., & Stein, B. S. 1993). the process of problem-solving as a cycle that includes the steps of defining, organizing, monitoring, and assessing Ill-defined issues and well-defined problems are the two types of problems(Anastasi, A., & Urbina, S. 1997; Cronbach, L. J. 1951). Problems that have well-defined objectives, a clear path to resolution, and identified roadblocks can be solved with the knowledge at hand(Nunnally, J. C., & Bernstein, I. H. 1994;Kline, P. 2000; Kaplan, R. M., &Saccuzzo, D. P. 2009). Many studies have been conducted on the solution process for well-defined issues, usually using algorithms to explain each step of the solution process(Messick, S. 1989; Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. 2004;Lord, F. M., & Novick, M. R. 1968). A collection of recursive procedures can be used to solve an issue that is well-defined by breaking it down into several smaller problems(Sireci, S. G. 1998; McDonald, R. P.1999; Cohen, J. 1988).On the other hand, because the problem is difficult to characterize as a collection of smaller components, it cannot be accurately addressed using these techniques(Guilford, J. P. 1954; Thorndike, R. M. 1997). An issue might show itself in several ways. It might be an obstacle preventing advancement or goal achievement. Miscommunication may easily develop when there is a lack of open and clear communication, which can lead to issues. It might also show itself as anything that deviates from your regular schedule or from what you had anticipated or believed(Brown, T. A. 2015). Lack of focus on people, procedures, communication, and a host of other unmonitored acts can also lead to problems(Embretson, S. E., & Reise, S. P. 2000).

When examining and identifying an issue, it is important to consider the who, what, where, when, why, and how of the problem. An issue can be found by focusing on its underlying cause.

For example, suppose the problem is that you dislike your job. In that case, you should identify the specific aspects of your employment that bother you to identify the components of the issue.

**Purpose of the Study**

The purpose of this study is to develop Human Problem-Solving Space Detection Test. Human problem-solving structures address academic and behavioural issues through collaborative

decision-making, leading to effective instructional and intervention strategies. Problem solvers identify problems by exploring the who, what, where, when, why, and how, narrowing them down to the root. Recognizing and exploring the problem space is crucial, highlighting the need for a tool to measure the distance between sub-goals. This study aims to create such a tool.

**Elements of a Problem**

Understanding the elements of a problem is crucial for framing and solving it. Problems are conflicts, questions, or situations with unknown solutions. Key characteristics include clarity, time, issues, multiple items, relationships, and opposing goals.

First, define the problem and understand its complexity before attempting to solve it.

**Defining a Problem**

To define a problem effectively, ensure you address the real issue, not just its symptoms. For instance, substandard class performance might seem like a student issue, but deeper analysis could reveal inadequate training or excessive workload. Look at the problem from various perspectives to avoid mistaking a solution for a problem statement. For example, "We must discipline people who do substandard work" prematurely suggests a solution. Instead, focus on understanding the complex situation to pinpoint the actual problem.

**Human Problem Solving**

In 1972, Allen Newell and Herbert Simon published "Human Problem Solving," outlining the concept of the problem space, which includes the initial state and all possible intermediary states. Actions taken to move from one state to another are known as operators. Given the large problem space, a key issue is how people navigate through possibilities with limited working memory. For many problems, domain knowledge helps, but for novel problems, Newell and Simon proposed the use of cognitive shortcuts called heuristics.

The simplest heuristic is "backup evidence," where individuals prefer to revert to a previous problem state. This is unhelpful when inappropriate actions necessitate going back several steps.

The solution process for well-defined problems has been extensively studied, often using algorithms to describe each step (e.g., Newell & Simon, 1972). A well-defined problem can be broken down into smaller problems and solved using recursive operations or algorithms. In

contrast, algorithms cannot be used for ill-defined problems because they cannot be easily divided into smaller components before finding a solution.

When framing a problem, one must identify the symptoms, determine objectives, and assess the effects to prioritize and influence problem-solving. The problem is defined by its elements and their relationships.

**Problem Solving Space**

Problem solving space is a set of state of knowledge applied to solve the problem causing & controlling knowledge transversion through the intermediate state. Problem space is an important aspect that requires conscious patterns during solving the problem, Newell introduced the problem space principle as focus.

"The rational activity in which engaged to solve a problem can be described in terms of -

1. A set of state of knowledge

2. operators for changing one state into another

3. constraint an applying operator and

4. control of knowledge for deciding with operators to apply next:

The problem of space is a domain-independent representation of knowledge that has been proposed by certain researchers. Typically, problem spaces have a collection of states, objectives, and valid operator's together with restrictions that direct logical progress toward the goal. The state contains literals that explain what is currently understood about the world.

**Components of Problem Space**

Mainly there are four component of problem space. These components are identified during problem solving. Those components are inter- related and inter connected to each other. First step always provides a guideline or next steps and so on. The four components of Problem Space are as follows.

**Stage of Knowledge**

The stage at which the nature and particular of the problem are recognized is known as the state of knowledge. It aids in classifying the issue as crisis-related, structured, or unstructured. It is

essential to comprehend the dangers, uncertainties, and surroundings around the issue. The process of determining the issue space begins with this.

**Operators**

Operators are actions taken to solve the problem. To address the problem space, first measure its difficulty and select stages accordingly. Arrange these stages in sequence, starting from beginning to end, using performance analysis. Compare each stage, then select and gather information about the operator. Use past experiences to guide actions, incorporating practice from previous successes. The problem space involves heuristic or reduction methods. Set target values for time and efficiency, establish sub-goals, and apply the same process to subsequent stages. Finally, decompose the problem, linking each stage through correlations.

**Constraint**

Operators are actions taken to solve the problem. To address the problem space, first measure its difficulty and select stages accordingly. Arrange these stages in sequence, starting from beginning to end, using performance analysis. Compare each stage, then select and gather information about the operator. Use past experiences to guide actions, incorporating practice from previous successes. The problem space involves heuristic or reduction methods. Set target values for time and efficiency, establish sub-goals, and apply the same process to subsequent stages. Finally, decompose the problem, linking each stage through correlations.

**Control of knowledge**

Control of knowledge involves deciding on the necessary actions to solve the problem. This stage follows recognizing constraints. Understanding problem-related operators aids in identifying solutions. Variations in recognizing operator solutions are analyzed using SWOT (Strengths, Weaknesses, Opportunities, Threats). This analysis considers cost, time, energy, timeline, and acceptability. Thus, knowledge of the Problem-Solving Space can effectively navigate any problem to its solution.

**Sample**

The present study is developmental in nature. The purpose of the study was to develop Problem Solving Detection Test and standardize it. For this, the components related to problem

solving space were identified and items were framed. These items was to be validated with the experts. For the same, the experts were selected from the corresponding field. Thereby experts from Education, Research, and Engineering Organization were chosen.

For construct validity and reliability students of a professional course were selected. Table wise the sampling distribution is given below.

**Nature of Study and Process:**

This study involves the developmental study in which a Detection was developed for measuring problem space during problem-solving. Problem space is a set of state of knowledge applied to solve the problem causing & controlling knowledge. It the Traversion from initial state of problem solving to final state of goal. Problem solving space Detection Test included four components which are as follows:

1. **State of Knowledge:**

   State of knowledge is the stage of knowledge in which the knowledge of specification, type and situation of Problem is known.

2. **Operator:**

   Operator are actions taken up to solve the problem.

3. **Constraint:**

   Element, factor, or subsystem that works as restriction against the action are sought to eliminate or minimize it.

4. **Control of knowledge:**

   Control of knowledge is decision for selecting the required action opted for solving the problem.

   The study related to Problem Solving Space Detection Test Detection was carried out in five phases. Keeping in mind the objectives of the study the steps incorporated are as exhibited in the tables

   **Construction of Problem-SolvingSpace Detection Test**

The first and foremost of the research study was to construct Problem Solving Space Detection Test. Problem-Solving Space Detection Test comprised of 37 items Problem Solving Space Detection Test was divided in to 4 heading designated on "State of Knowledge" "Operators", "Constraint" & control of knowledge." The detail of problem-Solving Space Detection Test is given in chapter in III.

The development of problem-Solving Space Detection Test for detection of Problem Space followed by its assessment for the procurement of its validity & reliability. The validity & reliability assessment here carried out was as follows.

**Validity of Problem-Solving Space Detection Test**

The validity was assessed in two stages. First stage to assess the content validity and the second stage was to assess the construct validity. Stage-wiseanalysis is given below.

**Content validity of problem-SolvingSpace Detection Test.**

The second objective of the research study was to test the Content Validity of the Problem-Solving Space Detection Test, developed.To fulfill this purpose Problem Solving Space Detection Test was handed over to 27 experts. Five-point scale were assigned to each item to assess its content validity. The five-point were designated as Most Relevant (MR), Relevant (R), Neither Relevant nor Irrelevant (NRI), Somewhat Irrelevant (SI) & Irrelevant (IR). Based on rating by experts, the validity was calculated in percentage. The result aboutthe content validity of the constructed problem-Solving Space Detection Test is shown in Table 1.1.

**Table 1.1 Content Validity in Percentage (%)**

| State of Knowledge | Items | Most Relevant | Relevant | Neither relevant irrelevant | Somewhat Irrelevant | Irrelevant | Total |
|---|---|---|---|---|---|---|---|
| | 1 | 80 | 32 | 6 | 4 | 0 | 90.3 |
| | 2 | 70 | 44 | 6 | 0 | 0 | 88.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 25 | 60 | 21 | 0 | 0 | 78.5 |
| | 4 | 40 | 60 | 12 | 0 | 0 | 82.9 |
| | 5 | 65 | 40 | 3 | 6 | 0 | 84.4 |
| | 6 | 50 | 52 | 6 | 4 | 0 | 82.9 |
| | 7 | 30 | 68 | 6 | 4 | 0 | 80 |
| | 8 | 50 | 40 | 21 | 0 | 0 | 82.2 |
| Operator | 9 | 60 | 40 | 6 | 4 | 1 | 82.2 |
| | 10 | 35 | 40 | 18 | 8 | 0 | 74.8 |
| | 11 | 40 | 40 | 24 | 2 | 0 | 78.5 |
| | 12 | 55 | 48 | 6 | 4 | 0 | 83.7 |
| | 13 | 15 | 40 | 21 | 12 | 1 | 66.5 |
| | 14 | 55 | 56 | 6 | 0 | 0 | 87.5 |
| | 15 | 50 | 56 | 9 | 0 | 0 | 85.1 |
| | 16 | 15 | 40 | 27 | 8 | 0 | 72.5 |
| | 17 | 40 | 40 | 21 | 4 | 0 | 77.5 |
| | 18 | 30 | 56 | 21 | 0 | 0 | 79.2 |
| | 19 | 20 | 52 | 21 | 4 | 1 | 73.3 |
| | 20 | 30 | 42 | 12 | 0 | 3 | 64.4 |
| | 21 | 15 | 36 | 24 | 2 | 6 | 61.4 |
| | 22 | 5 | 64 | 9 | 14 | 0 | 68.1 |
| | 23 | 35 | 28 | 24 | 8 | 1 | 79.1 |

| | ITEMS | MOST RELEVANT | RELEVANT | NEITHER RELEVANT IRRELEVANT | SOMEWHAT IRRELEVANT | IRRELEVANT | TOTAL |
|---|---|---|---|---|---|---|---|
| CONSTRAINT | 24 | 15 | 60 | 12 | 6 | 2 | 70.3 |
| | 25 | 40 | 52 | 15 | 2 | 0 | 80.7 |
| | 26 | 25 | 68 | 15 | 0 | 0 | 80 |
| | 27 | 15 | 60 | 15 | 8 | 0 | 72.5 |
| | 28 | 65 | 36 | 12 | 2 | 0 | 85.1 |
| | 29 | 15 | 56 | 27 | 2 | 0 | 74.0 |
| | 30 | 70 | 48 | 0 | 2 | 0 | 88.8 |
| | 31 | 15 | 60 | 15 | 8 | 0 | 72.5 |
| CONTROL OF KNOWLEDGE | 32 | 80 | 40 | 13 | 0 | 0 | 91.1 |
| | 33 | 35 | 44 | 27 | 0 | 0 | 78.5 |
| | 34 | 25 | 52 | 21 | 4 | 0 | 75.5 |
| | 35 | 35 | 76 | 3 | 0 | 0 | 84.4 |
| | 36 | 25 | 44 | 24 | 4 | 2 | 73.5 |
| | 37 | 25 | 56 | 15 | 4 | 2 | 75.5 |
| Total | | | | | | 78.3 | |

From table 1.1 its evident that total percentage of content Validity 78.3 in which item no 1,2,3,4,5,6,7,8,9,10,11,12, 14,15,16,17,18,19,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37 were more than 70% 13, 20,21,22 are more than 60%. No any item was less than 60%. The result shows that 37 items are related to Problem Solving Space Detection Test. It means that items of the Problem-Solving Space Detection Test was approvedby the experts. This followed the phase of sequencing the items.

**Sequencing of items**

The items were kept in sequence from high to low based on marks rated of each item. The item that got lowest marks were correct grammatically and words were replaced with appropriate one. Item number seven was removed because it was repeated.

Each component of the Problem-Solving Space Detection Test compressed only positive items. The items were put in logical order as per the rating (score) provided by experts. The logical placement of items in the stage of knowledge in show table 1.2

**Table 1.2 Expert rating related to "Stage of Knowledge"**

| **ITEM NO.** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|
| **OPINION** | 90.3 | 88.8 | 78.5 | 82.9 | 84.4 | 82.9 | 80 | 82.2 |

Table 1.2 shows that the item that gained high scoring by the expert were placed at the top while items with least scores were placed at the bottom. For example, item no 1,2,4,5,6 & 8 got above 80% 3$^{rd}$ and 7$^{th}$ got above 71% question no. 1 got a very high mark 90.3%. Question 7 was removed because of its repetition from least.

Component-wise expert ratings related to Operators are mentioned in the table given below.

**Table 1.3 Expert rating related to "Operators"**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OPINION (%)** | **82.2** | **74.8** | **78.5** | **83.7** | **66.5** | **87.5** | **85.1** | **72.5** | **77.5** | **79.2** | **73.3** | **64.4** | **61.4** | **68.1** | **71.1** |

Table 1.3 shows that related to operator's component items. Items were placed in logical order as per the opinion of expert in a way that item no 6&7 having higher score here placed at first and second of the sequence. Item no 13 rated 61.4 % was place last. The experts rating related to constraint items were as follows:

**Table 1.4 Experts rating related to "Constraint"**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|
| **OPINION (%)** | 70.3 | 80.7 | 80 | 72.5 | 85.1 | 74 | 88.8 | 72.5 |

Table 1.4 exhibits constraints component having 8 items. After pursuing the result, the item was placed in logical order as per the opinion of an expert in a way that items no. Item 7,5,2,3 was placed at position 1,2,3,4 respective similarity item no 4,8,1 was placed at point 5,6& 7 position respectively. Expert rating corresponding to items related to control of knowledge is given in Table 1.5

**Table 1.5 Experts opinion related to "Control of knowledge"**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|
| **OPINION (%)** | 91.1 | 78.5 | 75.5 | 84.4 | 73.5 | 75.5 |

Table 1.5 shows the experts rating related to "control of Knowledge" component. According to the result item no 1 and 4 received highest percentage. Therefore, the sequence followed placing item 1 as $1^{st}$, 4 as $2^{nd}$, 2 as $3^{rd}$, 3 as $4^{th}$, 6 as $5^{th}$and 5 as $6^{th}$ item.

**Pilot study (Construct Validity)**

To access construct validity, a pilot study was carried out Construct validity was sought to determined scores interpretation in items of knowledge of Problem Space and examine to its elements. It shall also determine scores dependent on experience ofproblem-solving.

The pilot study was sought by distribution the Test to 30 students of engineering. There was no time limit for taking the test. The result item wise of each element of Problem-Solving space Detection Test Component wise is given the table as the follows.

**Validity of state of Knowledge component**

To seek the validity of state of knowledge element of Problem-Solving space Detection Test. The score was interpreted as given in table 1.6

**Table 1.6 Validating "State of Knowledge"**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **Total** |
|---|---|---|---|---|---|---|---|---|
| **OPINION (%)** | **74** | **75.3** | **85.5** | **86** | **78** | **86** | **86** | **81.5** |

From Table 1.6 Its evident that item wise the score for state of knowledge component ranged from 74 to 86 Percentage. Therefore, all the items scored high construct validity in this section.

**Validity of " Operator" component**

To seek the validity of operator component of Problem-Solving Space Detection Test the score was interpreted as given in table 1.7

**Table no. 1.7:Validity of " Operator" component**

| ITEM NO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBTAIN (%) | 80.6 | 84.6 | 78 | 82.8 | 84.6 | 65.3 | 80.6 | 72 | 66.6 | 86 | 67.3 | 82 | 77.3 | 64.6 | 67.3 | 75.9 |

From table 1.6 it's evident that item wise the score for operator component ranged from 64.6 to 84.6% Operator is one of most important part of Problem-Solving space Detection Test. The

obtained score of operator's component reveals the construct validity of operator component was high.

**VALIDITY OF CONSTRAINT COMPONENT**

To seek the validity of constraint component of Problem-Solvingspace Detection Test in separately, the score was interpreted as given in table 1.8.

**Table 1.8 Validity of "Constraint" component**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|
| **Obtain (%)** | **68** | **82.6** | **83.3** | **72.6** | **73.3** | **80.6** | **79** | **79** | **76** |

From table 1.8 it's evident that item wise the score of constraint component 68 to 83.3 % is range of the items. The obtained score of constraint component reveals that the construct validity of constraint component was high.

**Validity of Control of Knowledge**

The score obtain related to construct validity of section 'Control of Knowledge' were as follows.

**Table no. 1.9: Validity of "Control of Knowledge" Component**

| **ITEMS** | **1** | **2** | **3** | **4** | **5** | **6** | **TOTAL** |
|---|---|---|---|---|---|---|---|
| **OBTAIN (%)** | **82.6** | **79.3** | **84** | **78** | **74** | **74** | **79.8** |

From table 1.9 its evident that item wise the scores of "Control of Knowledge "components. Range of control of knowledge component is 78 to 82.6 Percentage. The obtained score of Control of Knowledge component was high.In a nutshell the total score of "State of Knowledge"

component the score was 81.5% "Operators" component score was 75.9% and total score of 'Control' component was 76% Control of Knowledge" component obtain 79.8%. Therefore, it can saythat Problem Space Detection Test had high Construct Validity.Before assessing all the items in Space Detection Testthose Items with score comparatively low rating underwent language modification. Non items in Space Detection Test was removed and the time assigned was 30 minutes.

**Reliability of Problem-Solving Space Detection Test**

The reliability of Problem-Solving Space Detection Test was administered on 30 students of Professional Courses. The obtained data were further analyzed using Spearman Brown formula. Application of this formula provides on estimate of reliabilities. Which is essentially equal to the average of the split half reliabilities compared for all possible halves. Description of the reliability is given in following table.

### 1.1.1 Reliability of Problem-Solving Space Detection Test

To determine the reliability of Detection Test combined the score were divided as "odd even split". This followed analysis through the Spearman Brown formula. The data received is given in table 1.10

**Table 1.10 Reliability of Problem Space Detection Test**

| **N** | **Correlation** | **Reliability** |
|---|---|---|
| 130 | .66 | .80 |

From table 1.10 its evident that Problem Solving Space Detection Test adherence to the opinion provided from 130 students,the correlation was found to be .66. This shows that scores obtained from odd and even items of the Problem-Solving Space Detection showed high positive correlation. This exhibits that all the items of the Problem-Solving Space Detection have High Content Validity. Reliability was calculated from the correlation from the correlation had value 80.

**Discipline wise Reliability of problem-Solving Space**

**Detection Test**

To determine the discipline wise reliability of Problem-Solving Space Detection Test, the test was administered discipline wise. The score Obtained from each discipline then were divided as "odd" "even" split. This followed the spearman brown formula. The data is given in table 1.10.

**Table 1.11 : Reliability of Problem Solving Space Detection Test**

| **N** | **Course** | **Correlation** | **Reliabilities** |
|---|---|---|---|
| 100 | Engineering | .67 | 80 |
| 30 | Pharmacy | .75 | 85 |
| 30 | Education | .67 | 80 |

Table 1.11 Reliability of problem-Solving Space Detection Test adherence of the opinion provided 100 student of engineering 30 student of pharmacy, 30 student of Education. The Correlation was found to be .67, .75, .67 for engineering, pharmacy and education respectively. This shows that scores obtained from odd and even items of the Space Detection Test showed high positive correlation this means that all the item of Detection Test have high Reliabilities even discipline wise.

**Content Validity of Detection Test**

The objective of the study was to develop the Problem-Solving Space Detection Test, thereafter the second objective of the study was to determine the content validity of the Problem-Solving Space Detection Test. After the development of Problem-Solving Space Detection Test, it was distributed to field concern experts.As given in chapter IV the component of Space Detection test Were i.e. " state of Knowledge ", Operators, Constraint,Control of knowledge was to be assessed on five point scale or Most Relevant, Relevant, Neither Relevant Nor Irrelevant, Somewhat Irrelevant and Irrelevant. The score for most of the item were Highly Relevant.

The discrepancy was found between science,humanities experts& engineering expert. This discrepancy could be that Problem Solving Space Detection Test through included the contextual definitions, some of experts were more aware of problem space than others.

**Construct Validity of SpaceDetection Test**

The objective was to determine the construct validity Problem Solving Space Detection Test. As stated earlier the construct validity was carried out in form of pilot study. It was taken to know whether the tool can measure the problem space of problem-solving process. Problem Solving Space Detection Test required respondents' involvement to measure inclusive components. As mentioned earlier the construct validity was tested on subjects of engineering group. The result reflected that item wise all the score ranked high and very high. The high score could be because the contestants could recognize the elements of space Detection Process.Attempting of all test items speaks for examinees importance to all the componentsTalking the test in less duration exhibited the knowledge of Detection Test Process. This means that Problem Solving Space Detection Test was high in construct validity.

**Reliability of Problem-SolvingSpace Detection Test**

The objective was to determine the reliability of Problem-Solving Space Detection Test. Reliability refers to the consistency of the measure. A test is considered reliable if the same result is exhibited repeatedly. For example,if Space Detection Test is designed to measure the steps followed in solving the problem, each time the test is administered to subjects, the result should be approximately the same.

In this study split half method was use to assess the reliability of Problem-Solving Space Detection Test. The reason of using this method was paucity of time. In split half method it was checked weather some correlation existed between odd and even items of Problem-Solving Space Detection Test. The correlation was calculated using the Product Moment method and then reliabilities was calculated from the score of correlation by using Spear Brown formula. The reliability was found to be quite high. The reason for high reliability could be the 130 Participants of Professional Course could recognize the best items related to Problem Solving Space and were aware of Space Detection Process during Problem Solving. It could also be the contextual definition helped them to understand and rate the test items.

Therefore all 130 Participants scored high in rating the test items and the split half reliability score too was precured high.

**Reliability of Problem-Solving Space Detection Test Discipline Wise**

The reliability was found to be highest in pharmaceutical discipline. In other two disciplines too the reliability of the Problem-Solving Space Detection Test was high. The difference of reliability was 02whichis negligible. The draft of the Problem-Solving Space Detection Test was developed in English.

The difference of 02 could be that subjects of pharmacy were more attentive to participate in Problem Solving Space Detection Test. Yet other subjects of the study too scored high therefore it can be said that the Reliability of Problem-Solving Space Detection Test was high in respect to each field.

This shows all the contestants were familiar with space Detection Process one way or another. Therefore, they could attempt the item to its satisfaction. Therefore, it can be said that the Reliability of the Problem-Solving Space Detection Test was very high.

The objective was to find the reliability of Problem-Solving Space Detection Test Discipline wise As mentioned earlier the test was administered on 70 number of engineering students, 30 number of pharmaceutical student and 30 Education discipline. Reliability was processed separately for each precured date from respective discipline.

**Educational Implications**

Educational implication of the developed Problem-Solving Space Detection Test education implication for Researchers, Administrators teachers and parents are as follows.

**Researcher**

The Human Problem-Solving Space Detection Test's design and outcome suggest that it is helpful for examining problem-solving patterns both individually and in groups. As a result, this kind of space detection test can be used to identify how individuals with varying fields of study—such as technology, education, biology, and mathematics—solve problems.

A different kind of space detection test along the lines of the Human Problem-Solving Space Detection Test could be created by the researcher in addition to this. Additionally, the data from the Human Problem-Solving Space Detection Test can be used by the researcher as a tool for problem solving in the classroom.

**Administrators**

The administrators are teachers or subject experts or curriculum planners. During administration, administrators face different types of problem. They can use this Detection Test and solve their Problem Systematically.

**Teacher**

Teachers are the backbone of any institute. In order to run the class successfully, constantly the teacher has to improve their problem-solving method themselves. As well as teach their pupils to adopt the process. This Problem-Solving Space Detection Test can be taken by the teacher themselves to know the problem-solving strategy. The teacher can also allow their students to take the test through the Problem-Solving Space Detection as this well improve the strategy of Problem solving by identifying the Space Between sub goals and reaching the goal would be much easier.

**Parents**

Every Parent is either a professional and a member of the society. As a member of the society parent needs to have a cordial relation with family members, & other persons in the societies, during this cordial relationship different human Problemsculminates. Thereby one need to solve these problems by consciously being aware of the component of problem-solving space. This Problem-Solving Space Detection Test fan be used by parents to increase focused state of knowledge, operators, constraint & control of knowledge and they are by solve human problems.

**Conclusion**

The development and standardization of the Problem-Solving Detection Test, as outlined in this study, resulted in the creation of a reliable and valid instrument for assessing problem-solving skills across various academic disciplines. Through a rigorous process of theoretical framework development, literature review, expert evaluation, and empirical testing, a final set of 37 items was established and administered to a diverse sample of university students.

The findings demonstrate that the test exhibits strong reliability and validity scores within different academic contexts, particularly in the fields of Engineering, Pharmacy, and Education. This underscores the test's robustness and adaptability to the specific problem-solving nuances of each discipline. The successful validation of the Problem-Solving Detection Test provides a valuable tool for both academic and practical applications, facilitating a deeper understanding of human problem-solving capabilities.Furthermore, the research led to the creation of the Academic Jealousy Scale, which has been shown to be a reliable measure for evaluating academic jealousy. This instrument offers accurate and consistent scores, making it a significant contribution to the study of academic dynamics and its psychological impacts.Overall, the methodologies employed in this study ensure that both the Problem-Solving Detection Test and the Academic Jealousy Scale are comprehensive and effective tools, suitable for a wide range of academic research and practical applications in educational settings.

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