

001788

INTRINSIC MOTIVATION -  
A FACTOR IN A STUDENT'S  
CHOICE OF A SCIENCE  
OPTION AT THE GRADE IX  
LEVEL

by David William Lindsay Gault

Thesis presented to the Faculty of  
Education of the University of  
Ottawa as partial fulfillment of  
the requirements for the degree of  
Master of Arts in Education.



Ottawa, Ontario, 1973

UMI Number: EC56023

### INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

**UMI<sup>®</sup>**

---

UMI Microform EC56023  
Copyright 2011 by ProQuest LLC  
All rights reserved. This microform edition is protected against  
unauthorized copying under Title 17, United States Code.

---

ProQuest LLC  
789 East Eisenhower Parkway  
P.O. Box 1346  
Ann Arbor, MI 48106-1346

## ACKNOWLEDGEMENTS

This thesis was prepared under the supervision of Professor Marvin Boss, Ph.D., of the Faculty of Education, of the University of Ottawa.

The writer is indebted to Professor Bayne Logan, Ph.D., of the Faculty of Education, of the University of Ottawa, for many constructive criticisms and suggestions.

The writer is also indebted to his wife C. Gail Gault, B.A., B.L.S., of the Department of Energy, Mines and Resources for reading the original manuscript.

## CURRICULUM STUDIORUM

David William Lindsay Gault was born November 27, 1938, in Kingston, Ontario. He received his Bachelor of Arts degree from the University of Toronto, Toronto, Ontario, in 1959.

## TABLE OF CONTENTS

Chapter	Page
INTRODUCTION . . . . .	vi
LIST OF TABLES . . . . .	v
I.- REVIEW OF THE LITERATURE . . . . .	1
1. Berlyne's Theory of Epistemic and Perceptual Curiosity	1
2. Day - Specific and Diversive Curiosity	9
3. Intrinsic Motivation	13
4. Experimental Support for the Theory of Intrinsic Motivation	26
5. Summary and Basic Hypothesis	28
II.- EXPERIMENTAL DESIGN . . . . .	30
1. Refinement of Hypothesis	30
2. A Test for Intrinsic Motivation	32
3. Subjects	35
4. The Method of the Experiment	38
5. Analysis and Organization of Data	38
III.- PRESENTATION OF RESULTS . . . . .	40
1. Testing for Homogeneity of Variance	40
2. t-test for a Difference Between Two Sample Means	42
IV.- DISCUSSION OF THE RESULTS . . . . .	43
BIBLIOGRAPHY . . . . .	48
 Appendix	
1. PERSONAL CORRESPONDENCE FROM DAY . . . . .	50
2. PERSONAL CORRESPONDENCE FROM SWITZKY . . . . .	51
3. SCIENCE SURVEY . . . . .	52
4. OCCUPATIONAL PREFERENCE INVENTORY . . . . .	53
5. FREQUENCY DISTRIBUTION BY SCHOOLS AND SCIENCE OPTIONS . . . . .	57
6. RESEARCHER'S INSTRUCTIONS TO SUBJECTS . . . . .	58
7. <u>ABSTRACT OF INTRINSIC MOTIVATION - A FACTOR IN         A STUDENT'S CHOICE OF A SCIENCE OPTION AT A         GRADE IX LEVEL.</u> . . . . .	59

LIST OF TABLES

Table	Page
I.- Number of Subjects Selected and Number of Students Rejected from the Advanced and General Science Options by Schools . . . . .	37
II.- Sample Sizes, Means and Variances of Scores of Intrinsic Motivation for Advanced Science Subjects and General Science Subjects . . . . .	41

## INTRODUCTION

History has been marked by certain individuals who have striven to accomplish tasks which at first seemed beyond their abilities. These people have reached out and uncovered areas of knowledge which to their contemporaries may have seemed impossible. In their quest for discovery, they have put aside physical needs and striven against apparently insurmountable odds. One has only to think of famous scientists such as the Curies, who worked for hours without sleep or without food when they were struggling toward the first actual visual detection of radium.

Behavioural scientists have long asked why human beings devote so much time and effort in the acquisition of knowledge. Why, out of the seemingly infinite scope of comprehensible details in the universe, are certain pieces of knowledge more passionately sought and more readily remembered than others?

The writings of Berlyne and Day, two of the behavioural scientists who have studied human curiosity and intrinsic motivation, will constitute the theoretical basis of this investigation. Their writings on these topics lead to the hypothesis that certain types of individuals will choose the more difficult of two tasks, both of which can produce the same end result. The testing of this hypothesis is reported in this thesis.

A review of the literature of the theory of human curiosity and intrinsic motivation with a particular emphasis on the theory as developed by Berlyne and Day is presented in Chapter I. The basic hypothesis is stated in the conclusion of the chapter.

Chapter II begins with a refinement of the basic hypothesis. A method of measuring intrinsic motivation is presented, followed by the method of selection of the subjects. The chapter concludes with the introduction of the independent and dependent variables and the statistical methods to be used.

The statistical results are presented in the third chapter. A discussion of these results with suggestions for further research follows.

## CHAPTER I

### REVIEW OF THE LITERATURE

The review of the literature is concerned with the development of the theory of human curiosity and the theory of intrinsic motivation which arises from the former. The applicability of these theories in accounting for the reasons some individuals choose the more difficult of two tasks which yield essentially the same results, will be discussed.

The theories of two behavioural scientists, Berlyne and Day, will be examined so that an understanding will be gained regarding the melding of their theories in the latter parts of this chapter.

#### 1. Berlyne's Theory of Epistemic and Perceptual Curiosity

Berlyne writes that curiosity, according to certain learning theorists, is a motivational variable defined as "a drive which is reduced by the reception and subsequent rehearsal of knowledge".<sup>1</sup> Berlyne makes a distinction between this definition and the definition of curiosity drive he had studied in lower animals. In his study of the rat,

---

1 D. E. Berlyne, "A Theory of Human Curiosity", in the British Journal of Psychology, Vol. 54, issue of 1954, p. 180-191.

Berlyne found that there is a drive which is aroused by novel stimuli and reduced by continual exposure to these stimuli. Its reduction reinforces exploratory activity. Berlyne defines exploratory activity as any activity involved with approaching and examining stimulus objects. This type of exploration can also take place in a human but unlike the rat, a human's superior intellect allows him to learn and remember. Berlyne states that this is a manifestation of knowledge. For this reason, curiosity, according to Berlyne, can be divided into two parts, perceptual and epistemic. Perceptual curiosity is displayed by all animals, including man. This type of curiosity leads to increased perception of stimuli. Epistemic curiosity leads to the acquisition of knowledge. Firstly, epistemic curiosity, and secondly, perceptual curiosity will be discussed in greater depth in the paragraphs which follow.

Epistemic curiosity can be aroused by thematic probes, defined by Berlyne as "all stimuli which elicit trains of thought, whether verbal in content or not".<sup>2</sup> When an acceptable answer to one of these thematic probes is found, epistemic curiosity is reduced to a subthreshold value.

Berlyne, concerning epistemic curiosity, hypothesizes, "curiosity is aroused in a subject when a question is put to

---

<sup>2</sup> Idem, ibid., p. 182.

him whether by himself or by an external agent".<sup>3</sup> Epistemic curiosity can also be aroused by thematic probes that are strange, unusual and puzzling. When the drive causing the conflict is eliminated, the unfamiliar becomes familiar.

Berlyne states that

If conflict is a drive, the reduction of conflict will be reinforcing, and it will provide the explanation for the reward-value of investigating things that are puzzling and the learning of knowledge resulting from this investigation. Epistemic curiosity also will thus be attributable in many cases to a similar mechanism.<sup>4</sup>

Berlyne attributes the mechanism of epistemic curiosity to a drive brought on by some conflict, that is to say, a situation in which competing tendencies are fairly evenly matched in strength. Investigation will reduce the conflict and lead to a gain of knowledge. Berlyne<sup>5</sup> recognizes four phases during which conflict may occur to bring about an increase in the epistemic curiosity drive. Briefly stated these four are:

1. the question may contain incompatible parts;
2. the answer to the question may be unknown;
3. irrelevant trains of thought may be elicited by the question;

---

3 Idem, ibid., p. 184.

4 Idem, ibid., p. 185.

5 Idem, ibid., p. 186.

4. more than one possible answer may be recognized. At any or all of these phases, conflict may occur. The following discussion illustrates these four points more thoroughly.

The first way conflict may be aroused in an individual is by a question which contains ingredients that are incompatible according to the individual's previous experience and instruction. Such a question could be - Why is glass not considered to be a solid? This question, to a person not familiar with atomic and molecular structure, could bring on learned conflict. He learned from past experiences that glass appears to be solid. A teacher could be the designator of the question or the individual could have read about this fact and formulated the question himself. In either case, the epistemic curiosity drive is increased by this unexpected, surprising, strange or puzzling fact.

The second way conflict may be aroused in an individual is immediately after the formulation of the question. The individual may not find any surprising facts in the question itself but he may not know the answer. The person may have read somewhere that glass is not a true solid but the fact may have escaped any serious exploration at that time. In another context, the question may arise again and the person is not surprised by the question itself but he may become

interested in knowing the answer. If no responses have been learned to cover the seemingly incompatible combination of "glass" and "not solid", responses can be expected to occur that are associated with "glass" and some other activity, or "not solid" and some other activity, or simply "glass" alone or "not solid" alone. Berlyne says that the trains of thought leading out from these are likely to be of comparable strength and incompatible. Thus, conflict may occur adding to the drive-strength. The drive leading from this conflict is epistemic curiosity.

The third way conflict may be aroused in an individual occurs during these associative processes. In searching for the answer to the question, other irrelevant thoughts may occur which conflict with the motivation to answer the question. The thought of glass not being a solid could lead the student to think of the materials from which glass is made and the possible chemical reactions involved in making glass. Conflict between the seeming irrelevant new material and the tendency to answer the original question would be initiated. This example illustrates another type of learned conflict which can bring about an increase in the epistemic curiosity drive.

The fourth way conflict may be aroused in an individual is if the answers to the question appear equally plausible. This could occur when a student is faced with a well thought-out multiple choice question where all the answers appear

equally acceptable. Berlyne says that "the drive produced in these ways by conflict can only rightly be called 'curiosity' or 'a drive to know' if it is reduced by the process of knowledge-rehearsal".<sup>6</sup> Berlyne uses the term knowledge-rehearsal to mean that a drive can be aroused by a question and reduced by rehearsing its answer. The type of curiosity characterized by a drive to know, Berlyne classifies as epistemic.

This theory of epistemic curiosity implies that motivation will be most strongly aroused at an intermediate stage of familiarity. If the event is too unlike anything with which the subject is familiar, there will be little conflict. If, for example, the teacher had said that he would explain the molecular arrangement in glass using advanced quantum mechanics, he would have lost most of his students immediately because quantum mechanics is too unfamiliar to start learned conflict in the student. If, on the other hand, the event is too familiar, there also will be little learned conflict. For example, if a teacher begins a course of differential calculus with a review of the "two times table", little learned conflict will be elicited in his students. The content of the "two times table" will be so

---

6 Idem, ibid., p. 187.

familiar that little or no epistemic curiosity will be aroused.

In summary, epistemic curiosity is usually brought on by a thought-provoking experience which contradicts the student's previous knowledge and leaves him perplexed. The desire to solve the problem initiates epistemic behaviour reserved by Berlyne for an activity whose function is to equip the individual with knowledge. Epistemic curiosity institutes epistemic behaviour for the purpose of reducing the drive caused by the quest for knowledge.

The second form of curiosity, recognized by Berlyne<sup>7</sup> is perceptual curiosity which he restricts to a drive which is reduced by perception. This type of drive brings on specific exploration. Specific exploration has "the purpose of intensifying stimulation from specific portions of the stimulus field and is therefore exploration of a specific object - finding out about something".<sup>8</sup> Its intensity increases with collative properties, that is, properties which cause an interaction between the observer and the stimulus. These, according to Berlyne<sup>9</sup>, include novelty, complexity, ambiguity, incongruity and other properties which contain a measure of

---

7 D. E. Berlyne, "Conflict and Information-Theory Variables as Determinants of Human Perceptual Curiosity", in the Journal of Experimental Psychology, Vol. 53, No. 6, issue of 1957, p. 399-404.

8 H. I. Day and D. E. Berlyne, "Intrinsic Motivation", in Gerald S. Lesser, Ed., Psychology and Educational Practice, Glenview, Ill., Foresman and Company, 1971, p. 294-335.

9 Idem, ibid., p. 311.

unexpectedness and uncertainty. Collative properties depend on comparison of information from different sources. A scientist can be in the motivation state of perceptual curiosity in a chemistry lab if he is faced with the question of experimenting to find out what will happen if he mixes two chemicals together. The only way he can obtain the answer is to try the experiment himself. In this way, the scientist is employing specific exploration to reduce the drive causing perceptual curiosity. After the experiment is completed, the scientist may be driven by epistemic behaviour to find out why the observed change took place especially if it is unexpected. The drive causing perceptual curiosity may be reduced by specific exploration but a drive causing epistemic curiosity may be evoked causing the individual to use epistemic behaviour to reduce the drive caused by the quest for knowledge.

In summary, perceptual curiosity leads to increased perception of stimuli but it does not lead to acquisition of knowledge.

In this section, the theory of human curiosity, according to Berlyne, has been outlined. Berlyne considers curiosity to be a motivational state brought on by epistemic behaviour and specific exploration. In the next section, Day's theory of specific and diversive curiosity will be presented and compared with the theory of curiosity developed by Berlyne.

## 2. Day - Specific and Diversive Curiosity

Day distinguishes between two types of curiosity, specific and diversive. Day describes the first, specific curiosity as "the aroused state of an organism when confronted by an ambiguous or unclear stimulus and which may result in specific exploration".<sup>10</sup> This type of exploration is similar to Berlyne's specific exploration which leads to heightened arousal. Berlyne called this perceptual curiosity. Day says that specific curiosity is a "state induced by a condition of uncertainty resulting from exposure to stimulation high in collative properties".<sup>11</sup> Specific curiosity leads to a search for specific information. Day's theory of specific curiosity appears to incorporate not only Berlyne's perceptual curiosity, but also Berlyne's epistemic curiosity. Berlyne reserves epistemic curiosity exclusively for the motivation to equip the individual with knowledge.

An individual could arouse specific curiosity in another person by creating an environment in which the other person could perform specific exploratory behaviour and epistemic behaviour. An example could be in a secondary school Physics lab where the apparatus is purposefully arranged

---

10(a) Hy. Day, "Role of Specific Curiosity in School Achievement", in the Journal of Educational Psychology, Vol. 59, No. 1, issue of 1968, p. 37-43.

11 H. I. Day and D. E. Berlyne, Op. Cit., p. 313.

by placing powerful magnets and different types of metals on the lab bench. If the child is left to himself he will begin specific exploration by approaching the magnets and touching them. He will probably bring the magnet toward the metals. Some metals will be attracted, others will not. At this stage, epistemic behaviour will begin when he tries to find out the answer and gain knowledge. Thus, a task presented to a student which can elicit specific exploratory behaviour and in many cases epistemic behaviour will lead to a motivational state of specific curiosity.

Day's second type of curiosity is termed, diversive curiosity which he says "is a state motivated by a stimulus situation characterized by a lack of change, high redundancy and repetition and boredom."<sup>12</sup> This differs from specific curiosity which results from the presence of specific stimuli with high levels of collative variability. Diversive curiosity results from an environment that lacks interesting stimuli. In diversive curiosity, the search for more information may actually cause a search for risk-taking activities and a quest for excitement. Diversive curiosity could be the motivation behind the risk-taking of mountain climbing or the somewhat safer excitement of a ride on a roller coaster.

---

12(b) Hy. Day, "The Development of a Test of Intrinsic Motivation: A Progress Report", Paper delivered Saturday, December 6, 1969, at the Royal York Hotel, Toronto, 16 p.

Berlyne disagrees and says that an individual is prone to diversive exploration when he is bored. Berlyne<sup>13</sup> would not call this activity curiosity. He does not consider boredom a motivational state that is conducive to specific exploration.

From Day's theoretical position, it appears that the diversively curious child in a classroom would be the one who through boredom or lack of understanding would undertake any activity solely for excitement. This type of behaviour could manifest itself in throwing erasers, punching a lab partner or in some other disruptive action. This child could also try for excitement by drawing pictures of some imaginary exciting event or by reading adventure books or even by withdrawing into a dream world of his own. Day<sup>14</sup> suggests that specific curiosity is a multi-faceted concept often task specific as well as response specific. The specifically curious child would be interested in gaining knowledge from the specific lesson being presented or in gaining knowledge from the specific task at hand.

In society, the diversively curious child would be the one who would steal a car or shoplift on a dare from his friends or even out of boredom commit some crime.

---

13 D. E. Berlyne, "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluation Ratings", in the Canadian Journal of Psychology, Vol. 17, No. 3, issue of 1971, p. 274-289.

14 H. I. Day, Intrinsic Motivation and Vocational Choice, Unpublished Paper, April 1973, 6 p.

He even may be the type who would turn to drugs when other outlets for excitement are stymied. The specifically curious individual could also turn to drugs if he were firmly convinced that he was doing this to gain knowledge about the effect of drugs on a human organism. This would be specific exploration rather than diversive exploration.

In the home, the diversively curious child could be a discipline problem. More hopefully, his search for excitement through diversive exploration could be channelled into interesting hobbies or creative reading. This could lead to specific exploration and epistemic behaviour.

In summary, the diversively curious child is not intentionally seeking out information as is the specifically curious child. The diversively curious child is seeking arousal-reduction through some diversion. There appears to be a certain amount of overlap between the two types of curious individuals because the individual may expose himself to new experiences for the excitement which novelty and complexity themselves offer and the end result may be a gain of knowledge.

Another facet of Day's theory of curiosity is that individuals can vary in amount of curiosity.

Just as children vary physically and intellectually they also vary in amount of curiosity .... as with intelligence, people may be born with different potential for curiosity, but in contrast with intelligence curiosity

is not rewarded in the traditional school system and so seems to diminish, or at least not grow, with development of the child.<sup>15</sup>

Day goes on to hypothesize that the amount of curiosity a person possesses could be inborn or developed through maturity. One individual may be more specifically or diversively curious than another.

Day's theory of curiosity was presented in this section. Some of the characteristics of the specifically and diversively curious person have been described. A comparison was made with Berlyne's theory of curiosity treated in the previous section.

In the next section, curiosity is described as a motivational factor.

### 3. Intrinsic Motivation

Day<sup>16</sup> suggests that motivation in the classroom may take either or both of two forms, extrinsic to the task itself or intrinsic to it. Extrinsic motivation comes from some reward that is outside the performance of the task itself. It may be immediate, for example, a teacher handing back to a student a good mark for a lab report. It may be mid-range, for example, a student working toward a good report

---

15 H. I. Day and D. E. Berlyne, Op. Cit., p. 318.

16 Hy Day, (b) Op. Cit., p. 1.

card at the end of a term. It may be long-term, for example, a student working toward a Secondary School Honours Graduation diploma which he would require to enter university.

Intrinsic motivation comes from the premise that the task itself may be enjoyable and rewarding. An example would be, the taking up of a hobby simply for enjoyment, not because a doctor ordered it. A student taking an MA degree could also be intrinsically motivated because he may find the courses rewarding. A person could be intrinsically motivated to watch an interesting television program simply for enjoyment, for knowing what the program was and for reducing any specific curiosity the program itself may have brought about. However, another person could be extrinsically motivated in watching the same television program if he had to watch the program for information to pass an examination. If this were the only purpose for watching the program, the person would be fully extrinsically motivated.

It appears that most activities can be both extrinsically and intrinsically motivated, as pointed out in the above examples of persons watching a TV program.

Day's definition of intrinsic motivation relates to curiosity.

Intrinsic motivation is often called curiosity and has been defined as a condition of heightened tension or arousal induced by a stimulus high in collative variability, i.e., novelty, complexity,

incongruity, fuzzyness and other stimulus characteristics which make it difficult for an individual to understand readily and respond to a stimulus definitely.<sup>17</sup>

Day's definition of intrinsic motivation is derived from his theory of curiosity described in Section 2. A person who is intrinsically motivated would commence specific exploration. A person who is not intrinsically motivated, would be uninterested in the situation altogether or he would have such a lack of understanding of the situation that he would try to avoid it altogether.<sup>18</sup>

Haywood writes that intrinsically motivated individuals are characterized by a significant tendency to approach tension-inducing interpersonal situations. Children who had early successes in attempts at exploration and environmental mastery, will tend to have a higher rate of exploratory behaviour. Children who were frustrated in these early attempts by punishment, by failure or by adult disapproval, will tend to have a lower rate of exploratory behaviour and a subsequently lowered intrinsic motivation. This is in agreement with Day concerning his view that individuals vary in amount of curiosity.

---

17 Hy Day, (b) Op. Cit., p. 2.

18 H. Carl Haywood, "Individual Differences in Motivation Orientation: A Trait Approach", an Invited Paper presented as part of a symposium chaired by the author and entitled, "Individual Differences in Motivational Level", at the Ontario Institute for Studies in Education, Toronto, Ontario, June, 1970, p. 3 - 4.

Haywood disagrees with Day concerning a motivation-as-tension-reduction model. Haywood suggests that tension reduction is not a sufficient explanation for the motivating properties of exploratory behaviour. Haywood's position is that there may be circumstances in which tension induction is gratifying, without the necessity for tension reduction.

Haywood uses a slightly broader concept of intrinsic motivation as motivation intrinsic to task performance and achievement with the term, intrinsic, referring to the task rather than the individual. Haywood states that "intrinsically motivated individuals seek their principal satisfactions through some aspect of task achievement".<sup>19</sup> This implies that the intrinsically motivated individual is happy in the performance of the task itself. Haywood views extrinsically motivated individuals as those who seek primarily to avoid dissatisfaction by concentrating their attention upon the non-task aspects of their environment.<sup>20</sup> He uses the term non-task aspects to include such things as ease, comfort, safety, security, health, and material gain. Day, in his definition of an extrinsically motivated individual, also concentrates on the non-task aspects of the environment but differs from Haywood in that the individual is looking for some reward that is outside the performance of the task itself. Haywood and Day

---

19 Idem, Ibid., p. 9.

20 Idem, Ibid., p. 9.

are in general agreement that the non-task aspects refer to types of material rewards.

The theory of intrinsic motivation developed jointly by Berlyne and Day will be reviewed in the latter part of this section.

Berlyne and Day, in their joint article<sup>21</sup>, agree that motivation is of two kinds, extrinsic and intrinsic. Berlyne and Day suggest that behaviour which is extrinsically motivated can be considered that which has a goal external to the act itself. For example, an individual shovels the driveway at night after a snow storm so that he can drive his car to work in the morning. The goal is to get to work in the morning, not the act of shovelling the snow.

Berlyne and Day state that intrinsic motivation takes place when the goal is inherent within the act itself. An individual paints a picture of a beautiful scene, for the pleasure of painting the picture, not the possible goal of selling the painting later on. The motivation for painting the picture could be for the reward of painting (intrinsic) and for the reward of selling (extrinsic). Berlyne and Day recognize that it is often difficult to distinguish between these two kinds of motivation. As the example of the painting illustrates, the person may have had only intrinsic reasons for

---

21 H. I. Day and D. E. Berlyne, Op. Cit., p. 298.

painting the picture at first, but if he needed money the extrinsic reason for painting the picture would predominate. This happens when a person is extremely hungry. At first there is only the extrinsic motivation to reduce hunger. When the hunger drive has been diminished, the person can be more selective in his choice of food and he can enjoy eating for the sake of eating. This is intrinsic motivation. As this example shows, Berlyne and Day also include as extrinsic motivators stimuli which are normally aversive such as pain and hunger. These can also cause movement toward a more comfortable state.

These motivators may sometimes influence behaviour in directions that are not entirely congruent with the goals of the activity itself. Such factors include externally applied rewards, punishments, and competition.<sup>22</sup>

If a teacher assigns a project to a class, the goal of the activity is for each student to hand in a completed project. The teacher will hope that each student will like the project and complete it because it is inherently interesting. However, the teacher realizes that not all the students will want to do the project. To make sure that these students will do the project, the teacher may give some form of punishment such as loss of extracurricular activities if the project is not completed on time. This may lead to behaviour which is not in

---

22 H. I. Day and D. E. Berlyne, Op. Cit., p. 298.

the direction of the original goal. Some students may only do the project since they do not wish to be punished.

To summarize Berlyne's and Day's thoughts on intrinsic motivation, the following is their definition which is based on a physiological concept - the arousal system.

.... intrinsic motivation is directed towards the search for information with the purpose of reducing a heightened level of arousal which resulted from a situation in which adequate information to select an appropriate response was not available.<sup>23</sup>

The discussion on curiosity suggests that situations high in collative variability, i.e., situations which cause an interaction between the observer and the stimulus, seem to induce a state of high tension which can be relieved by specific exploration and epistemic behaviour. This may result in the acquisition of knowledge. The motivation behind this search for information is intrinsic. Berlyne and Day write "intrinsic motivation is relevant to immediate problems but its influence can pervade long-range attitudes and education both within the classroom and eventually throughout one's life."<sup>24</sup> Extrinsic motivation, on the other hand, is related to the task here and now, and extrinsic motivation is usually applied by an individual in the form of some social reinforcement. Intrinsically

---

23 H. I. Day and D. E. Berlyne, Op. Cit., p. 298.

24 H. I. Day and D. E. Berlyne, Op. Cit., p. 296.

motivated people choose to do things that fulfill the need to know and understand whereas in some cases it may be more important for the individual to satisfy one of the physiological or safety needs first. This is apparently shown by some of the great explorers who drive themselves to physical and mental exhaustion in striving to discover the unknown, instead of resting and satisfying the obvious physical needs first.

Based on the above discussion of Berlyne's and Day's theory of intrinsic motivation, there appears to be two types of intrinsically motivated individuals. The first of these, the specifically intrinsically motivated individual would tend to show the following characteristics:<sup>25</sup>

1. He has a positive attitude toward stimulation high in arousing qualities.
2. He is interested in and willing to tackle strange and incongruous objects or problems when they are introduced into his environment.
3. He explores these strange and incongruous objects by asking questions, manipulating them, or thinking about them.

The diversively intrinsically motivated individual would tend to show the following characteristics:<sup>26</sup>

---

25 H. I. Day and D. E. Berlyne, Op. Cit., p. 319.

26 H. I. Day and D. E. Berlyne, Op. Cit., p. 319-320.

1. He seeks stimulation, creates excitement, and challenges the world around him.
2. He seems willing to face adversity, take risks, and extend himself into new and daring situations.

There is a common bond between the specifically and diversively curious individuals because the diversively intrinsically motivated person must enjoy being in these situations and he reacts positively and with good feeling when he faces a situation high in collative variability.

The non-intrinsically motivated individual or the non-curious individual would tend to display the following characteristics:<sup>27</sup>

1. He is phlegmatic and sluggish.
2. He is unmoved by ordinary degrees of stimulus change.
3. He reacts to arousal-inducing properties in the environment by becoming anxious, and after repeated bad experiences tends to avoid change.
4. He may be sensitive to too many (or too few) elements in the environment so that he always seems to over - (or under-) react.

As noted previously under curiosity, individuals seem to have different potentials for curiosity. Perhaps the following quote from Berlyne and Day may give some further understanding.

---

27 H. I. Day and D. E. Berlyne, Op. Cit., p. 319.

Children who have been punished for tackling collative variability - either by failure which they recognize intrinsically or by low grades given by teachers who had insisted on stereotyped answers to their questions - may decline to exhibit curiosity. Children whose curious behavior has been ignored by parents and teachers may simply have their curiosity extinguished.<sup>28</sup>

This suggests that even if intrinsic motivation is a personality variable, it can be increased or decreased by the child's environment. A child who has faced failure or who has faced some unfortunate experience with a teacher of a subject, could have his natural curiosity for the subject diminished or even extinguished. The converse could also be true. A student who has lost his natural curiosity, could have it rekindled by an enlightened teacher, or a stimulating experience of some kind.

From the above discussion, an intrinsically motivated person who was faced with choosing a task of any type, would tend to choose a task with which he had some prior knowledge. He must not be too acquainted with the task or it will lack the novelty to intrinsically motivate him.

The intrinsically motivated individual is not the type who is performing the task because he did not succeed at it previously. A person who has been unsuccessful, in reality, has been punished for attempting collative variability. This

---

28 H. I. Day and D. E. Berlyne, Op. Cit., p. 319.

reaction could also be displayed by a person who has been consistently belittled about his performance of a task even though he may actually be succeeding.

A curious person is one who, when faced with a problem or situation, will explore the problem. The curious person is one who is willing to try to think out the solution to a problem. He would not be the type of individual who is not really interested in the situation at all, or the one who finds the situation so difficult that he would tend to withdraw from it.

An individual may be uninterested in the task at hand but he may be compelled to take up the task. This person would not be intrinsically motivated to perform the task. If there were a choice between two tasks of differing complexity, leading to the same end result, this individual probably would select the less difficult of the two tasks.

An individual may find the task so difficult that normally he would tend to withdraw from it. This person would not be intrinsically motivated to do the task. He may be forced to perform the task because of extenuating circumstances. If there were two levels of the same task leading to the same result, this type of person would tend to choose the easier task because the chance of completing the task would be greater.

In summary, the types of individuals who are not intrinsically motivated enough to approach and try to perform a more complex task, are those who

1. have previously not succeeded at the task;
2. have attained consistently low levels of achievement when trying to perform the task;
3. do not particularly enjoy the task;
4. are unsure of themselves in the task environment;
5. are forced to try to perform the task;
6. find the task too difficult;
7. for some other reason or reasons, perhaps stretching back into their earlier years, are not as intrinsically motivated as they might be.

The type of individual who is intrinsically motivated enough to approach and try to perform a more complex task would be the type of individual who is

1. more satisfied through task achievement;
2. characterized by a significant tendency to approach tension-inducing interpersonal situations.

The person who chooses the less complex task would be the one who seeks primarily to avoid tension-inducing interpersonal relationships. An intrinsically motivated person, when faced with the problem of choosing between two tasks of differing difficulties, would tend to choose the one which is more challenging, simply because it is inherently more

challenging. A person who is less intrinsically motivated, would not feel that the challenge itself is worth the risk of failure and he would tend to choose the easier task.

Day states that

The curious individual may be the one with a propensity for either becoming more curious under common curiosity arousing conditions or more readily becoming curious under many different conditions or both.<sup>29</sup>

This supports the view that a more intrinsically motivated person would tend to choose the more difficult task simply because it is more difficult. The greater difficulty would be more curiosity arousing.

Berlyne and Day note that people indulge in activities that fulfill the need to know and understand. This is a manifestation of intrinsic motivation. They further state:

We find too, that, given options for a course of study, students will often elect difficult subjects which carry the threat of hard work and possible failure, but promise the excitement of learning.<sup>30</sup>

This suggests that if an intrinsically motivated person had the choice between two tasks, one of which carried the threat of hard work and possible failure, but promised the excitement of learning, whereas the other was less challenging, he would tend to choose the harder task.

---

29 Hy, Day, (b) Op. Cit., p.3.

30 H. I. Day and D. E. Berlyne, Op. Cit., p. 297.

#### 4. Experimental Support for the Theory of Intrinsic Motivation

There is some experimental support for the theory of intrinsic motivation. Haywood<sup>31</sup> compared overachieving and underachieving ten year old school children from the inner city population of Toronto, with respect to intrinsic-extrinsic motivational orientation. He used an adaptation of Hamlin and Nemo's "Choice-Motivator Scale", a slight modification of which, is called the "Occupational Preference Inventory". He found that overachievers were relatively more intrinsically motivated than underachievers in the three academic areas tested - reading, spelling and arithmetic. He also found that the differences in motivational orientation between overachievers and underachievers was largest in the educable mentally retarded range and smallest in the superior range. The overachievers tended to be motivated to a greater extent by factors inherent in the performance of tasks, while the underachievers tended to be more motivated by factors extrinsic to the task. Such factors were the ease, safety, comfort and security aspects of the environment.

---

<sup>31</sup> H. Carl Haywood, "Motivational Orientation of Overachieving and Underachieving Elementary School Children", in the American Journal of Mental Deficiency, Vol. 72, No. 5, issue of March 1968, p. 662-667.

Haywood and Dobbs<sup>32</sup>, tested eleventh and twelfth grade boys at each of two widely differing socioeconomic levels. These subjects were given Hamlin and Nemo's "Choice Motivator Scale", Endler, Hunt, and Rosenstein's S-R Inventory of Anxiousness, a multiple-choice vocabulary test, and a manifest anxiety inventory. They found amongst other things that intrinsically motivated individuals are characterized by a significant tendency to approach tension-inducing interpersonal relationships. They suggest that an hypothesis dealing with the development of task orientation versus environmental orientation is tentatively suggested.

Peterson and Lowery<sup>33</sup> in their study with first grade children found that some children respond to puzzle-solving situations by rearranging items. Others exhibit less continuous and less intense exploratory behaviour. They respond to novel or unfamiliar objects by manipulating them but they fail to rearrange or modify the items. Others are conspicuously lacking in exploratory behaviour. The children who explored seem to be intrinsically motivated because they explore for the sake of exploring.

---

32 H. C. Haywood and Virginia Dobbs, "Motivation and Anxiety in High School Boys", in the Journal of Personality, Vol. 32, 1964, p. 371 - 379.

33 R. W. Peterson and L. F. Lowery, "Study of Curiosity Factors in First Grade Children", in Science Education, Vol. 52, issue of October 1968, p. 347 - 352.

These studies give some support to the theory of intrinsic motivation as hypothesized by Berlyne and Day. The studies suggest that there are two types of motivation, extrinsic and intrinsic. The individuals who are intrinsically motivated perform at a higher level than expected. The intrinsically motivated individuals do tend to approach tension-inducing situations and explore for the sake of exploring.

#### 5. Summary and Basic Hypothesis

In a review of the literature on the theory of intrinsic motivation developed by Berlyne and Day, it was indicated that intrinsic motivation is a state of tension arising from response conflict due to uncertainty or insufficient knowledge about an observation or concept. This leads the individual to further study or exploration with the goal of obtaining additional information and so relieving the conflict and tension.

One purpose of the latter part of this thesis is to identify a task which can be used to test the theory of intrinsic motivation developed by Berlyne and Day. The task must be such that it can be performed at differing levels of difficulty yet yield the same end result.

From the theory of intrinsic motivation as developed by Berlyne and Day, the following is the research hypothesis.

Subjects who choose the more complex of two tasks which lead to the same end result, will be more intrinsically motivated than subjects who tend to choose the less complex of two tasks.

The research hypothesis will be operationally defined in the following chapter.

## CHAPTER II

### EXPERIMENTAL DESIGN

This chapter presents the procedures involved in conducting an experiment to test the hypothesis proposed in the preceding chapter. It begins with a description of the refinement of the basic hypothesis followed by a description of the test instruments. The method of selection of the subjects is outlined, followed by the method of conducting the experiment. The chapter concludes with a description of the experimental design.

#### 1. Refinement of the Experimental Hypothesis

This section deals with the selection of a suitable task which can be used to test the experimental hypothesis.

The experimental hypothesis states in part that the individual who tends to choose the more complex of two tasks which can lead to the same result, is more intrinsically motivated than the individual who chooses the less complex of the two tasks. The task used to test this hypothesis must consist of two levels, one more complex than the other. The task levels, regardless of complexity or difficulty have to lead to the same end result. One task which fits the above criteria is the grade nine Science course which contains both

a General option and an Advanced option. From the course descriptions of these options, it is evident that the Advanced option is more difficult than the General option. The Advanced option requires more mathematics and more laboratory skill. Successful completion of either option permits the student to continue Science at a higher level as well as earning the student an academic credit. Furthermore, Science is not compulsory.

In summary, the Advanced Science course is more difficult hence it would be more arousal-inducing than the General Science course. There is more uncertainty, more complexity, more novelty and more ambiguity in a more difficult option. These factors will induce a state of higher tension which in turn will bring about more specific exploration and epistemic behaviour than in the General Science option.

As well as fitting the criteria for a task from the research hypothesis, the grade nine Science option offers the following advantages:

1. A high percentage of the students entering secondary school choose Science. This yields a large sample size.
2. The students are organized into classes of about thirty, which makes a convenient testing unit.
3. Science is taught in schools in the same urban centre and the schools are reasonably close together. The writer, himself, is able to conduct the experiment in each school.

4. The students entering secondary school or those who were already in the secondary school had made a clear choice between two tasks of differing complexity, namely the General Science or the Advanced Science.

On the basis of the selection of the grade nine Science as the task, the experimental hypothesis is the following.

Students who choose the Advanced Science option will be more intrinsically motivated than students who choose the General Science option.

## 2. A Test for Intrinsic Motivation

Several tests were considered for appropriateness in measuring intrinsic motivation amongst ninth grade students. The first instrument to be considered was Day's "Ontario Test of Intrinsic Motivation", OTIM. In personal correspondence, Day<sup>34</sup> indicated that the OTIM was designed for adults and that the questions might not be as interesting or useful to the age group proposed. Day suggested that the author review the Penney and McCann "Children's Reactive Curiosity Scale" (RCS) or a test developed by Haywood. Day noted that he thought the Haywood test would be better for this study.

---

<sup>34</sup> H. I. Day, Personal Correspondence, November 27, 1972.

According to literature<sup>35</sup>, the RCS of Penney and McCann was suitable for use with children in grades four, five and six. Therefore, following the recommendation of Day, the Haywood test, which was an adaptation<sup>36</sup> of Hamlin and Nemo's "Choice Motivator Scale", was selected as the measure of intrinsic motivation. This instrument offered ease of marking. It is an indirect measure of intrinsic motivation, therefore there is less opportunity to fake an answer. Permission for use of the test and the manner of scoring were obtained from Harvey N. Switzky<sup>37</sup>, Haywood's Research Assistant. Haywood entitles his version of the "Choice Motivator Scale" as "The Occupational Preference Inventory".

The "Occupational Preference Inventory", (Appendix 4), contains twenty items. For each of the twenty items the subject is requested to state which of the two occupations he would rather follow and he is to give a reason for his choice. The subject is given ten reasons from which to choose

---

35 R. K. Penney and B. McCann, "The Children's Reactive Curiosity Scale", in Psychological Reports, Volume 54, issue of 1964, p. 323 - 334.

36 H. Carl Haywood, Op. Cit., p. 664.

37 Harvey N. Switzky, Personal Correspondence, January 25, 1973.

one only for each item. Switzky<sup>38</sup> writes that the subjects are to be told that the researcher is interested in job preferences. However, as a measure of intrinsic motivation, the important part is the reasons the subjects select. Switzky further notes that to score the test, the number of intrinsically motivated reasons out of twenty are counted. According to Switzky, five of the choices (see note with Appendix 4), are scored as intrinsically motivated reasons, the other five being extrinsically motivated reasons.

Switzky writes: "The reliability of the test is approximately  $r = .75$ , using the test-retest method over a period of about three months. The Choice-Motivator Scale can be used to test your subjects in groups of about thirty."<sup>39</sup> The groups of thirty correspond to the testing unit, a classroom, chosen by this writer.

Some changes were necessitated in the instrument. The writer substituted the words "Prime Minister" in place of the word "President" in item 2. This was done because Canadian subjects were being measured and there would be more familiarity with the office of Prime Minister than that of President. Similar instructions for the Inventory were used except that

---

38 Idem, ibid., p. 1.

39 Idem, ibid., p. 1.

the students were requested to use a separate answer sheet. The answer sheet was used for more efficient marking in view of the large numbers of subjects proposed for the experiment. The next section outlines how these subjects were selected.

### 3. Subjects

The subjects were chosen from grade nine Advanced Science and grade nine General Science students in four secondary schools in an Eastern Ontario urban centre. Permission to enter the grade nine Science classrooms was obtained from the Heads of the Science Departments of the various schools after the nature of the experiment was explained. The researcher tested 798 students from the four schools.

The theoretical basis of this experiment suggests that the individual himself must select the task and that the individual must be aware that one task is more complex than the other. To identify these students the writer constructed a "Science Survey" instrument (see Appendix 3) consisting of eleven items. The students who checked "yes" to items 1 and 11 were selected as subjects for this research because they chose the Science option themselves and they realized that one option was more difficult than the other.

As a result of this selection process, 458 subjects were chosen from the Advanced Science and 138 subjects were chosen from the General Science (see Table 1). The scores of

these selected students on Haywood's "Occupational Preference Inventory" were compiled. The large difference in numbers between the Advanced subjects and the General subjects occurred because in each of the four schools, there were only two General Science classes. The minimum number of Advanced Science classes was five with a maximum of ten.

The next section outlines the method used in conducting the experiment in the four secondary schools.

TABLE I.-

Number of Subjects Selected and Number of Students Rejected  
from the Advanced and General Science Options by Schools

School	SUBJECTS		REJECTED		Total
	Advanced	General	Advanced	General	
1	139	30	71	12	252
2	79	44	17	10	150
3	145	34	52	11	242
4	95	30	16	13	154
Total	458	138	156	46	798

#### 4. The Method of the Experiment

Two instruments, the "Science Survey" and the "Occupational Preference Inventory", were administered to all the grade nine Science students who were available, during their regular class periods with their own teachers in attendance. On four different days the writer administered the instruments personally, to the grade nine students of the four schools which the researcher deemed representative of the population. A standard set of instructions (see Appendix 6) was given to each class.

The students required an average of twenty minutes to complete both instruments. This was well within the bounds of the forty minute class period. The class teacher assigned other work to fill the remaining time.

The raw scores of intrinsic motivation for the four schools are recorded in Appendix 5.

The analysis and organization of the data is covered in the final section of this chapter.

#### 5. Analysis and Organization of Data

The independent variable was the choice of a Science option whether Advanced or General. The dependent variable was the score of intrinsic motivation as measured by the "Occupational Preference Inventory" instrument of Haywood.

The data was organized into numerical scores for intrinsic motivation for each of the subjects chosen from the Advanced Science students and the General Science students (see Appendix 5).

A non-directional t-test for differences between means was used to test for any difference between the means of the scores of intrinsic motivation of the Advanced Science subjects and the General Science subjects. The level of significance was set at 0.05.

The next chapter of this thesis will outline the presentation of the results of the experiment.

## CHAPTER III

### PRESENTATION OF RESULTS

This chapter presents the statistical analysis of the data. The raw scores on the "Occupational Preference Inventory" are listed in Appendix 5 by schools. Table II presents a statistical summary derived from the raw scores.

#### 1. Testing for Homogeneity of Variance

One of the assumptions of the t-test is that there is homogeneity of variance of the measures of different populations. In order to test this assumption, Bartlett's test for homogeneity of variance<sup>40</sup> was used because of unequal population sizes.

Chi square was calculated to be 0.192. The critical value of Chi square with the level of significance equal to 0.05 and one degree of freedom is 3.8. The assumption of homogeneity of variance holds.

---

<sup>40</sup> B. J. Winer, Statistical Principles in Experimental Design, Second Edition, McGraw-Hill Book Company, New York, 1971, p. 208 - 209.

TABLE II.-

Sample Sizes, Means and Variances of Scores of  
Intrinsic Motivation for Advanced Science  
Subjects and General Science Subjects

	Number	Mean	Variance
Advanced Science	458	12.876	9.2181
General Science	138	11.464	10.91

## 2. t-Test for a Difference Between Two Sample Means

The research hypothesis was tested in the null form.  $t$  was observed to be 4.48. The rejection region for the null hypothesis is  $t$  greater than 1.96. The null hypothesis is rejected. The difference between the means was in the hypothesized direction.

The Advanced Science students and the General Science students do differ significantly on their scores of intrinsic motivation as measured by the "Occupational Preference Inventory." As hypothesized, the Advanced Science students were more intrinsically motivated than the General Science students.

## CHAPTER IV

### DISCUSSION OF THE RESULTS

With students who choose the grade nine Science course themselves, those who select the Advanced option are more intrinsically motivated than those who select the General option.

Berlyne's and Day's theory of intrinsic motivation provides a possible explanation of these results. In this theory, conflict arousal occupies a central role in determining the strength of intrinsic motivation. Because the Advanced Science option is more difficult, it is more conflict arousing than the General Science option. The Advanced Science option is more appealing to the more intrinsically motivated student than the General Science option.

The results of this experiment do lend support to the theory that the more intrinsically motivated individual tends to choose the more challenging of two tasks which can yield the same result.

A suggestion for future research emerges from this study.

Are individuals who choose the more difficult tasks in other areas more intrinsically motivated than the individuals who choose less complex tasks? For example, are students who choose the Enriched Chemistry option in grade thirteen more

intrinsically motivated than students who choose the Advanced Chemistry option in grade thirteen? The task could be chosen from across subject lines. For example, are students who choose the Mathematics and Science options at any level, more intrinsically motivated than students who choose options such as History and Spanish? These options all yield one credit each and can lead to University.

While the results do substantiate the theory in a statistical way, there appears to be little difference between the means of the scores of intrinsic motivation in a practical way. Is this result because students who choose Science are already intrinsically motivated because they have picked a challenging and exciting option whether Advanced or General? Do these students think of Science as inherently more motivating just because it is Science? This study seems to indicate an affirmative answer to these questions. The means of the Advanced Science students' scores and the means of the General Science students' scores on Haywood's "Occupational Preference Inventory" are both over ten. This result suggests that the Science students are more intrinsically motivated than extrinsically motivated. A score of zero on the "Occupational Preference Inventory" represents a maximal extrinsic motivation score, whereas a score of twenty represents a maximal intrinsic score.

Another topic for research comes naturally out of this study. Do science students change in intrinsic motivation from the beginning of the school year to the end of the school year after being exposed to a course such as Science? In this research, the "Occupational Preference Inventory" was administered about two-thirds of the way through the school year. The exposure to the Science course during the school year could have reawakened the intrinsic motivation of the students so that even though the results were significantly different statistically, practically they were very similar. Theory seems to suggest this possibility. Berlyne and Day say that individuals do have different potentials for curiosity. As quoted above, Berlyne and Day say that children whose curious behaviour has been ignored, may have had their curiosity extinguished. The writer suggests that the converse can also take place. A student's curious behaviour can be rekindled by a stimulating and exciting environment in which the student is achieving. As the school year progressed, the General Science students, after exposure to Science and the questioning and reasoning behind the Scientific Method, may regain some of their intrinsic motivation potential. In this way, the gap between the Advanced Science student and the General Science student on scores of intrinsic motivation would decrease. Day suggests that this is possible.

Thus the curious individual may be one with a propensity for either becoming more curious under common curiosity arousing conditions or more rapidly becoming curious under many different conditions or both.<sup>41</sup>

Since Day equates curiosity and intrinsic motivation, he is saying that the intrinsically motivated person can become even more intrinsically motivated under the proper conditions. If the task itself is inherently challenging, an intrinsically motivated individual will increase in intrinsic motivation. The converse is also suggested. If the task is not intrinsically motivating, the individual can actually decrease in intrinsic motivation. For educators, it is clear that their task is to make their subject areas as exciting and intrinsically motivating as possible. For these reasons, the students will choose their courses because they are intrinsically motivated to do so. If the students are more motivated, the teachers themselves should become more motivated.

Students who enter secondary school in Ontario do not have any compulsory courses. Since students are not compelled to take options that are not appealing to them, it is to be hoped that they are choosing areas that are exciting and challenging. The reduction in enrollment in some courses might be a further point of research. Are the subject areas in which

---

41 Hy Day, (b) Op. Cit., p. 3.

student enrollment is decreasing, the less intrinsically motivating options? Is the decline in enrollment in some courses caused by the fact that they are too difficult and not tension inducing? Theory seems to suggest both possibilities.

Educators in Ontario are facing a difficult and challenging time. Research must be performed to discover more about the relationship between teacher, student and task.

## BIBLIOGRAPHY

Berlyne, D. E., Conflict, Arousal and Curiosity, McGraw-Hill, Toronto, 1960.

As Berlyne notes on p. 1, "This book is going to be concerned with the motivation of perceptual and intellectual activities.

Berlyne, D. E., "A Theory of Human Curiosity", in the British Journal of Psychiatry, Vol. 45, 1954, p. 180-191.

The author presents his theory of human curiosity and introduces the term "epistemic curiosity", to be distinguished from "perceptual curiosity".

Day, Hy, "The Development of a Test of Intrinsic Motivation: A Progress Report", a Paper delivered Saturday, December 6, 1969 at the Royal York Hotel, Toronto, 16 pages.

The author outlines his ideas on Intrinsic and Extrinsic motivation.

Day, H. I. and D. E. Berlyne, "Intrinsic Motivation", in Psychology and Educational Practice, edited by Gerald S. Lesser, Harvard University, Scott, Foresman and Company, Glenview, Illinois, p. 294-335.

Day and Berlyne meld their ideas on intrinsic motivation, going over early motivational theories, their definition of intrinsic motivation, and the modern theories.

Day, H. I., D. E. Berlyne, D. E. Hunt, "Intrinsic Motivation: A New Direction in Education", A Symposium, sponsored by The Department of Applied Psychology, The Ontario Institute for Studies in Education, Toronto, June 11-13, 1970.

The authors develop and use the theory of intrinsic motivation as related to education.

Haywood, H. Carl, "Individual Differences in Motivational Orientation: A Trait Approach", an Invited Paper presented as part of a symposium chaired by the author and entitled "Individual Differences in Motivational Level" at the Ontario Institute for Studies in Education, Toronto, Ontario, June, 1970, 31 pages.

This symposium was conducted in the presence of Berlyne, Day and Hunt and is Haywood's contribution to intrinsic motivation theory.

Langevin, R., "Is Curiosity a Unitary Construct", in Canadian Journal of Psychology, Vol. 25, No. 4, 1971, p. 360-373.

The author tests the hypothesis that curiosity is multifaceted and representative curiosity measures were compared.

Maw, Wallace H. and Ethel W. Maw, "Establishing Criterion Groups for Evaluating Measures of Curiosity" in Journal of Experimental Education, Vol. 29, No. 3, issue of March, 1961, p. 299-305.

The Maw's definition of curiosity is outlined along with the method of selection. It is an attempt to gain a measure of curiosity.

Penney, R. K., and B. McCann, "The Children's Reactive Curiosity Scale", in Psychological Reports, Vol. 15, 1964, p. 323-334.

From the authors' summary: The present study reports the description of and the normative data obtained with a scale of reactive curiosity for use with Grade 4, 5 and 6 children.

APPENDIX 1

YORK UNIVERSITY

4700 Keele Street, Downsview 463, Ontario

November 27, 1972

Mr. David W. Gault  
2188 Edmard Crescent  
Ottawa, Ontario  
K1J 6K6

Dear Mr. Gault:

Thank you for your interest in the OTIM. I am pleased that you are doing the thesis you describe in your letter. It is an interesting and necessary question for intensive research.

The OTIM is actually designed for adults, and the questions may not be as interesting or useful to your age group as a test designed for younger students. I would suggest that you choose for your study a test designed by Penney & McCann for children or better yet one designed by Haywood. The P & M test was published in Perceptual & Motor Skills some years ago. The Haywood test can be obtained by writing to him at Peabody College for Teachers in Tennessee.

I hope the information is useful to you.

Sincerely

"H. I. Day"

H. I. Day  
Associate Professor

HID:pc

APPENDIX 2

GEORGE PEABODY COLLEGE FOR TEACHERS

Nashville, Tennessee 37203

The John F. Kennedy Center for Research  
on Education and Human Development

January 25, 1973

David W. Gault  
2188 Emard Cres  
Ottawa, Ontario  
K1J 6K6

Dear Mr. Gault:

The reliability of the test is approximately  $r=.75$ , using the test-retest method over a period of about three months. The Choice-Motivator Scale can be used to test your subjects in groups of about 30. I am sending you a copy of the instructions for this test. You tell your subjects that you are interested in job preferences. Really what is important are the reasons people pick for their job preferences. To score the test just count up the number of IM reasons out of twenty. The test is not copyrighted so all you have to do is to duplicate the one I sent.

I hope your study works. Good luck.

Sincerely yours,

"Harvey N. Switzky"

Harvey N. Switzky  
Research Assistant Professor

HNS:pg  
Enclosure

APPENDIX 3

SCIENCE SURVEY

Date: \_\_\_\_\_

Name: \_\_\_\_\_ School: \_\_\_\_\_

Form: \_\_\_\_\_ Male or Female: \_\_\_\_\_

Period: \_\_\_\_\_ Type of Science  
(Advanced or General)

This is not a test. This is a survey to find out how you chose the science option you are now taking.

Please check (✓) either yes or no for each question.

	Yes	No
1. I chose this science option myself.		
2. I chose this science option because my parent(s) or guardian(s) wished me to.		
3. I chose this science option because a teacher told me I should.		
4. I chose this science option because my guidance counsellor recommended it.		
5. I chose this science option because my friend also chose it.		
6. I chose this science option because my brother or sister had taken the course.		
7. I chose this science option because an older friend had taken the course.		
8. I chose this science course for a reason not stated above. The reason is		
9. I knew that this option will enable me to take a science course at a higher level.		
10. I am planning to take a science at a higher level.		
11. I understand that an Advanced science is more difficult than a General science.		

Please turn to the next page and read the instructions for the Occupational Preference Inventory.

## APPENDIX 4

### Occupational Preference Inventory

#### Note:

This is not a test. It is a survey to find out in what type of jobs you are interested, and the reasons for your choice.

#### Instructions:

1. Please fill in the required data on the top of the answer sheet.
2. Put all the answers on the answer sheet. Do not write on the inventory sheets.
3. Each item on this scale consists of two things that you might be or do. In each item choose the one you would rather do if you had to be one or the other, and for each item darken the letter (a or b) on the answer sheet under the "occupation" column of the answer sheet. Assume that you are able to do anything that you want to do.
4. The list at the top of the page contains ten reasons that might explain why you chose one activity over another.

Look at the ten possible reasons for preferring one activity or vocation more than the other. Pick the reason for your choice (or the reason that is closest to your own reason). Darken the letter of that reason (A to J) in the "Reasons for Choice" column on the answer sheet.

5. As an example, we shall take the first item. You read that the item asks you which you would rather become: a librarian or a dentist. After you have decided, darken the appropriate letter on the answer sheet.

Now ask yourself: "Why did I want to be the one I chose to be more than I wanted to be the other?" Look up at the ten possible reasons and find the one that best explains why you chose to be the one that you darkened, more than the other.

Darken the letter of the reason, under the "Reasons for Choice" column on the answer sheet.

6. Any of the reasons at the top of the page can be used more than once if you wish. You do not have to find a different reason for each item.
7. Go on to the remaining items. Work quickly without worrying about each item.

(Note: I.M. reasons are A, E, G, H, and I)

## Occupational Preference Inventory

Reasons for Making Choices

- |   |  |
|---|--|
| A. I could learn more                     | F. I would have more money.            |
| B. It would be easier.                    | G. I like excitement and adventure.    |
| C. People would have more respect for me. | H. I like to be in charge.             |
| D. It would be safer or healthier.        | I. I like beautiful things and places. |
| E. I like to do hard things.              | J. I have done it before.              |

Which would you rather be:

- |                        |    |                         |
|------------------------|----|-------------------------|
| 1. a. librarian        | or | b. dentist              |
| Why?                   |    |                         |
| 2. a. Prime Minister   | or | b. movie star           |
| Why?                   |    |                         |
| 3. a. florist          | or | b. Navy officer         |
| Why?                   |    |                         |
| 4. a. mountain climber | or | b. baby sitter          |
| Why?                   |    |                         |
| 5. a. student          | or | b. teacher              |
| Why?                   |    |                         |
| 6. a. play golf        | or | b. work a jigsaw puzzle |
| Why?                   |    |                         |
| 7. a. truck driver     | or | b. electrician          |
| Why?                   |    |                         |
| 8. a. farmer           | or | b. banker               |
| Why?                   |    |                         |
| 9. a. manager          | or | b. office worker        |
| Why?                   |    |                         |
| 10. a. artist          | or | b. salesman             |
| Why?                   |    |                         |

---

Reasons for Making Choices

- |   |  |
|---|--|
| A. I could learn more.                    | F. I would have more money.            |
| B. It would be easier.                    | G. I like excitement and adventure.    |
| C. People would have more respect for me. | H. I like to be in charge.             |
| D. It would be safer or healthier.        | I. I like beautiful things and places. |
| E. I like to do hard things.              | J. I have done it before.              |
- 

11. a. ditch digger or b. deep-sea diver

Why?

12. a. butcher or b. pilot

Why?

13. a. bird watcher or b. mechanic

Why?

14. a. ride a motorcycle or b. play checkers

Why?

15. a. baseball player or b. scientist

Why?

16. a. cook or b. astronaut

Why?

17. a. watch a sunset or b. sell newspapers

Why?

18. a. trash collector or b. musician

Why?

19. a. photographer or b. keep bees

Why?

20. a. ride a bicycle or b. read a book

Why?

APPENDIX 5

Frequency Distribution of  
Raw Scores by Schools and Science Options

ADVANCED SCIENCE																					
School	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Number of Subjects
1	0	0	0	0	0	3	0	5	4	14	14	12	9	19	17	13	15	10	3	1	139
2	0	0	0	0	0	1	4	5	3	13	7	13	5	3	5	10	6	4	0	0	79
3	0	0	0	0	1	3	3	4	6	20	20	14	28	11	11	12	6	5	0	1	145
4	0	0	0	0	0	0	2	4	8	11	5	14	8	13	15	2	8	3	2	0	95

GENERAL SCIENCE																					
School	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Number of Subjects
1	0	0	0	0	0	0	4	3	5	3	1	3	5	1	3	1	0	0	0	1	30
2	1	0	1	0	0	2	1	3	6	3	4	8	3	5	5	1	0	1	0	0	44
3	0	1	0	0	0	1	0	2	3	8	1	5	4	5	2	2	0	0	0	0	34
4	0	0	0	0	1	1	0	3	2	1	3	4	4	3	3	1	0	2	2	0	30

## APPENDIX 6

### RESEARCHER'S INSTRUCTIONS TO SUBJECTS

I am a high school Chemistry teacher who is doing research for my Masters degree in Education at the University of Ottawa. I am interested in why you chose Science and I am also interested in what jobs you prefer and the reasons for choosing them. To find out this information I shall give you two things to fill out. One is called a "Science Survey" and the other is called an "Occupational Preference Inventory".

To complete the "Science Survey" just put check marks in the appropriate spaces. You may check "yes" more than once or "no" more than once.

When you have completed the "Science Survey" proceed to the "Occupational Preference Inventory" and carefully read the instructions. Please note that you place your answers on the answer sheets provided. Please do not consult with your friends about any answers. If there are further questions please raise your hand and I shall endeavour to answer them personally.

## APPENDIX 7

### ABSTRACT OF

#### Intrinsic Motivation - A Factor in a Student's Choice of a Science Option at the Grade IX Level<sup>1</sup>

Students in Ontario Secondary Schools have no compulsory courses. In many cases, the choice facing a student is made more complicated by the division of the subject area into levels such as Advanced and General.

This study used Berlyne's and Day's theory of intrinsic motivation. It was hypothesized that the individual who chooses the more complex of two tasks which lead to the same end result, would be more intrinsically motivated than the individual who chooses the less complex of the two tasks.

The task chosen was the grade nine Science course which is divided into two levels Advanced and General. The Advanced option is more difficult but both options lead to a credit and a chance at further studies in Science at a higher level.

The subjects were chosen from the grade nine Advanced and General Science classes of four Eastern Ontario secondary schools. The choice of subjects was determined by a "Science Survey" instrument constructed by the author. The students who indicated on the "Science Survey" that they had selected

---

<sup>1</sup> David W. L. Gault, masters thesis presented to the Graduate School of Education of the University of Ottawa, Ontario, May, 1973, 60p.

the option themselves and that they realized that the Advanced option was more difficult than the General Option, were retained for the study. Out of 798 students, 458 Advanced students and 138 General students were selected as subjects. The results of the subjects' scores of intrinsic motivation on Haywood's "Occupational Preference Inventory" were used in this study.

The research hypothesis was supported. The null hypothesis of no significant difference between the mean score of intrinsic motivation of the Advanced Science students and the mean score of intrinsic motivation of the General Science students was rejected. The level of significance was set at 0.05.

The grade nine Science students in the four Eastern Ontario Secondary schools surveyed, are more intrinsically motivated than the grade nine General Science students in the same four schools.