A REPORT ON THE DEVELOPMENT OF AN INSTRUCTIONAL UNIT ENLISTED "SIGNALS ACROSS THE WAVES: MARCONI'S RECEPTION OF THE FIRST TRANSATLANTIC WIRELESS SIGNALS"

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A Report on the Development of an

Instructional Unit Entitled

"Signals Across the Waves; Marconi's Reception

of the First Transatlantic Wireless Signals".

By

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A Report Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Education

Division of Learning Resources

Faculty of Education

Memorial University of Newfoundland

December 1983

St. John's Newfoundland

Acknowledgements

The researcher wishes to acknowledge the contribution of a number of people whose assistance made possible both the development of the instructional unit and the writing of this report.

Sincere gratitude is expressed to Dr. R.T. Braffet who not only supervised the project, but who also prepared the graphics for the slide-tape programme. Special thanks also go to Dr. G. Fizzard and to Dr. M. Kennedy for their assistance and direction throughout the completion of this project.

Appreciation is also expressed to the administrators and Grade Five teachers of Holy Trinity School, Torbay; St. Paul's School, St. John's; and St. John Bosco School, St. John's, for evaluating the instructional material in their schools. Thanks also go to the Learning Resources staff of the Education Faculty of Memorial University for their help and co-operation in the preparation of this project. As well, thanks go to the staff at the Provincial Archives, to Mrs. Mary Devine of Signal Hill National Historic Park and to Mrs. Betty Hance, Company Historian, Marconi House, Chelmsford, England.

Finally, very special thanks must go to my wife, Catherine, for her unending patience and encouragement throughout the development of the instructional unit. Without her constant support, this project might not have been completed.

Abstract

The purpose of this study was to develop instructional material on Guglielmo Marconi's reception of the first transatlantic wireless signals for use as supplementary material for the Grade Five Newfoundland history text.

It was the researcher's contention that few materials were readily available on this topic at this grade level. A review of existing materials both print and non-print, confirmed that this was the case.

A survey of thirty-five teachers of history in Grade Five was conducted. The findings indicated that insufficient resource material was available to teachers, and that a supplementary unit on Marconi would be welcomed. The preferred medium of instruction was the sound filmstrip.

An instructional package was produced with formative evaluation carried out at various stages by learner specialists, media specialists, a content specialist and Grade Five students. A summative evaluation involved a three-group design with analysis of results including comparisons of means, examination of percentage of items correct and an item analysis. The results proved to be quite favourable.

In conclusion, a slide-tape programme entitled "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" is now ready for use in the Social Studies Programme for Grade Five.

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CHAPTER I

INTRODUCTION

Man is by nature a social being. Consequently, he has always felt a need to communicate with others. In earliest times, he was able to satisfy this need by the spoken word. This method, however, proved inadequate when it became necessary to communicate over distances exceeding the range of the human voice. Therefore, man had to somehow overcome this problem and avail himself of technical means to extend the range of his message. His search for a means to improve the extent of his transmissions ultimately gave rise to the science of communication.

Modern communication methods, however, have only been in existence for about one hundred and fifty years. Prior to the middle of the seventeenth century, all forms of communication were rather simple. Messages were communicated by such diverse means as human messengers, homing pigeons, fire and smoke, flags, drums, bells, cannon shots, and the movement of sails on ships.

Towards the end of the seventeenth century things began to change. As a result of the rapid pace of development in Europe, faster communication systems capable of transmitting more information became a necessity. Initially, researchers had concentrated on improving the existing methods by preparing codes to standardize and interpret the signals. Before too long, however, methods such as the semaphore, electrical telegraph and telephone were perfected and established. Then, towards the end of the nineteenth century, scientists discovered a way to use electricity to communicate directly, without wires linking the transmitter and receiver. A wireless communication system was about to be born.

Several scientists played important roles in the discovery of wireless, but it was a young Italian inventor, Guglielmo Marconi, who adapted their systems and perfected the results of their work. In 1896, Marconi succeeded in transmitting a message a distance of nine miles. Wireless telegraphy had been invented, and now Marconi simply had to improve his equipment to transmit over greater distances.

On March 27, 1899, Marconi sent the first wireless signals across the English Channel, thus linking England and France. His success greatly encouraged him, and by 1901 he was ready to send the first transatlantic wireless message.

Marconi's transmitting station was located at Poldhu, in southern England, while his receiving station was set up in an old building on top of Signal Hill, St. John's, Newfoundland. There, on December 12, 1901, Marconi heard the three faint dots of the Morse letter "S". A new era in telecommunications had begun.

This was a significant event in Newfoundland history, but it was not the first time that Britain's oldest colony had played a key role in the communications field. In 1858, the first Atlantic cable had been landed at Bay Bulls Arm, Trinity Bay, thus establishing a telegraph link with Europe. Unfortunately, this cable broke, but in 1866 a second cable was brought ashore at Heart's Content. When the Island was linked with the mainland of Canada and the United States by telegraph, Newfoundland became the centre of international communication.

The story of the Atlantic cable is well known in Newfoundland schools. However, the same cannot be said of Marconi's great achievement. Most students know very little about Marconi or the circumstances surrounding his reception of the first transatlantic wireless signals.

It is doubtful that many students are aware that this was a tremendous feat, or that Marconi's work would eventually lead to the development of radio.

To help elementary students in Newfoundland schools learn more about the historical achievement performed by Guglielmo Marconi on Signal Hill, St. John's, Newfoundland on December 12, 1901, this researcher determined to produce an instructional package entitled "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals."

The Place of Marconi and Wireless Communication in the Curriculum

The curriculum of Newfoundland and Labrador schools, as prescribed by the Department of Education, is outlined in the Program of Studies. The Program of Studies 1982-83 lists all materials to be used by each grade from Kindergarten to Level III in the Reorganized High School Programme. The courses listed in this publication have been examined with regard to their content as it relates to Guglielmo Marconi's historic achievement in Newfoundland.

It appeared that the subject best suited for the inclusion of references to Marconi and his wireless experiments in Newfoundland was Newfoundland and Labrador History in Grade Five. Upon examination of the prescribed text, Newfoundland and Labrador: A Brief History (Harris, 1968), the researcher found that this topic was given cursory treatment. In the Chapter entitled "The Second World War", the importance of Newfoundland in transatlantic communication is discussed. Marconi and his reception of the first wireless signals from across the Atlantic are only briefly mentioned. Nonetheless, an accompanying photograph of

Marconi and his wireless equipment is provided.

It is the opinion of the researcher that this event is significantly important in the history of Newfoundland to warrant more detailed study. A growing interest is developing in Newfoundland history, literature and culture. There is a need for Newfoundland students to learn more about the history of their province. Marconi, and the tremendous feat he performed in receiving the first wireless signals across the Atlantic Ocean on Signal Hill in St. John's, Newfoundland deserves a prominent place in Newfoundland history.

CHAPTER II

NEEDS ASSESSMENT

Statement of Needs

As indicated in Chapter I, a great historical event took place in Newfoundland in the early years of the twentieth century, when Guglielmo Marconi received the first wireless signals from across the Atlantic Ocean. It was pointed out that students in Newfoundland schools have only a limited knowledge of this feat and its significance in world-wide communication.

The need for additional material on Marconi and the reception of wireless signals across the Atlantic in Newfoundland was brought to the attention of the researcher by several Grade Five teachers. In their discussion of filmstrips and other supplementary materials that could be used with the Grade Five Social Studies programme, it was discovered that many excellent projects had been completed on Newfoundland topics, but almost nothing seemed to be available on Marconi and the reception of the first wireless signals on Signal Hill in St. John's. It was suggested to the researcher that perhaps something could be developed on this topic which might be useful to the Social Studies teachers at the Grade Five level.

In order to establish that a specific need did exist for such supplementary materials, the researcher interviewed informally a number of Grade Five teachers in the St. John's region. Discussion centered around such questions as: "Does the Grade Five history text provide enough information on Marconi and the reception of the wireless signals?"; "Would you like to see some supplementary materials on this topic?"; and

"Do you think that there is a need to cover this topic in greater depth?" The majority of teachers interviewed agreed that there was both a shortage of information and a need to cover the topic in more detail.

Subsequent to these informal interviews, the researcher compiled a questionnaire to gather information as to whether these views were reflected by Grade Five teachers across the province, and to determine if any resource materials were being used. The questionnaire (Appendix C) was mailed to thirty-five Grade Five teachers throughout the Province of Newfoundland. Twenty-seven questionnaires were returned, and the findings summarized below in Table I.

Table I

Awareness and Use of Materials
Regarding Marconi in Newfoundland History

Question	Yes	No	Total
1. Is there sufficient information provided on Marconi and wireless in the Grade Five history text Newfoundland and Labrador: A Brief History (Harris, 1968)?	0	27	27
2. Would there be some value in studying this topic in greater depth?	25	2	27
3. Are you presently using any resource material, on this topic, beyond what is in the text?	8	19	27

It was obvious to the researcher from the responses on the returned questionnaires that only a few materials of a general nature did

exist on this topic, and that other supplementary materials were clearly needed.

To seek further confirmation that supplementary materials were needed on this topic, the researcher then contacted the Newfoundland Department of Education, and in conversation with the Provincial Social Studies Consultant confirmed that little or no resource material was available on this topic. The Director of the Instructional Media Centre did, however, bring to the attention of the researcher two audio-tapes which had been produced by the School Broadcast Division. These will be discussed below.

The researcher also contacted a number of Social Studies Consultants at the School Board level and all indicated that they had no knowledge of existing supplementary materials on Marconi. Several librarians were also consulted, but none was aware of any specific materials available, or of any materials presently being used by teachers.

Alternate Solutions

Since teachers had indicated that supplementary materials were needed concerning Marconi and his achievements in Newfoundland, and since little seemed to be available, the researcher was confronted with a problem to which there existed three possible solutions. The first, and obviously the best, would be to carry out an intensive search to determine what commercially developed print and non-print materials, already in existence, could be made readily available to Grade Five teachers.

The second solution would be to make modifications to any materials that already existed but that were unsuitable for Grade Five students.

A third alternative would be for teachers, curriculum committees,

or individuals who had researched a particular topic to produce instructional materials suitable for the Grade Five level.

The researcher then considered each of the three solutions.

Survey of Existing Materials

To determine if either the first or second alternative could be adopted, the researcher surveyed the resources of the Queen Elizabeth II Library at Memorial University, the University Curriculum Centre, the University Centre for Audiovisual Education and its Resources Clearing House. The Instructional Materials Division, Department of Education, the National Film Board of Canada, the Provincial Reference Library and the various public libraries throughout the city of St. John's were also surveyed for existing materials on this topic. As well, the researcher contacted the Maritime History Group, the Signal Hill National Historic Park (Parks Canada), The Canadian Marconi Company, and Marconi House, Chelmsford, England.

Print Materials

The investigation into various print materials revealed that very few existing materials on Marconi are suitable for use in elementary schools. Most materials available are in form of adult biographies of Marconi, or histories of the Marconi Company. Most devote only limited space to Marconi's historic experiment in Newfoundland. The high level of vocabulary and technical terms used in the print materials are well beyond the reading level of Grade Five students. Some of the books examined may, perhaps, be used as background reading material by Social Studies teachers, provided the teacher can acquire them.

The following is an annotated list of print materials discovered:

Books

Atlantic Bridgehead: the story of Transatlantic Communications (Clayton, 1968)

Chapter VII of this book covers the story of the first wireless signals across the Atlantic. A brief account of Marconi's early work is provided, and his historic breakthrough in Newfoundland is presented in some detail. Although this book may serve as background material for the teacher, caution should be exercised, as several incorrect statements are made by the author. As well, the vocabulary and writing style make this a poor source for Grade Five students.

Chapters of Marconi History (n.d.)

As an adult history, this book presents a comprehensive overview of Marconi and his work with wireless communication. However, it is of little value to Grade Five students, as the level of writing is beyond the elementary student. The book may also be extremely difficult to obtain, as it has been out of print for many years.

Communication in Newfoundland (Meaney, 1937)

This is a rather dull and difficult account of the telegraph, cable, wireless and telephone systems in Newfoundland. Marconi's historic achievement on Signal Hill, St. John's, is summarized well but too much irrelevant material is included. The unfamiliar writing style, difficult vocabulary and seemingly unrelated discussion make this unsuitable resource material for Grade Five students.

The Evolution of Electric Wave Telegraphy (Fleming, 1970)

This very technical book contains the basic story of the first wireless signals across the Atlantic. However, it may be difficult to comprehend by anyone who is not well versed in the technical aspects of

wireless.

Guglielmo Marconi (Gunston, 1970)

Like other biographies of Marconi, this book traces his life from boyhood and early wireless experiments at Bologna, Italy to his last years as a senator in Rome. Chapter IV, entitled "The 'Big Thing' and After" deals with Marconi's successful transmission of wireless signals across the Atlantic. This account is not as well written as others in that its information is sometimes sketchy. Parts II and III of this book are concerned primarily with technical information on wireless communication and its development.

Guglielmo Marconi: 1874-1937 (Geddes, 1974)

This is a rather general account of Marconi, his Company, and wireless experiments. Each stage in Marconi's life is covered very briefly. The information on the transatlantic venture is sketchy, and adds little to one's understanding of Marconi's great achievement.

An History of Communications and the Cabot Tower of St. John's, Newfoundland (Proulx, 1978)

This manuscript, provided by Parks Canada, contains a brief section on Marconi. Not enough information is provided to make an adequate background source for the teacher or student.

A History of the Marconi Company (Baker, 1970)

This history begins with a brief resumé of early scientific discoveries in the field of electricity up to 1896, and records the fortunes of the Marconi Company. The book details the story of radio communications. The chapter on the reception of the first wireless signals across the Atlantic is quite thorough, and could provide teachers with interesting background information. Technical and detailed explanations suggest that

this book may be far beyond the reading level of most Grade Five students in Newfoundland schools.

Marconi (Jolly, 1972)

This is an excellent biography of Marconi and his work in the development of wireless communication. All aspects of Marconi's life are covered in depth, with one chapter being devoted to his spanning the Atlantic with his wireless signals. As an adult biography, this book is an excellent source of background reading for teachers, but it is too difficult for most elementary students.

Marconi and his Wireless (1963)

This is a very short summary of Marconi and the development of wireless communication, of which only one paragraph is devoted to the Atlantic experiment. For teachers, this presents an overall view of the development of wireless, but it is not suitable for elementary students. The information provided is complicated, and many technical words are used throughout. This booklet may not be readily available.

The Marconi Company: Jubilee Year (1947)

This is a relatively brief summary of the achievements of the Marconi Company during its first fifty years (1897-1947). Although the book features a number of excellent photographs dealing with the reception of the first wireless signals across the Atlantic at St. John's, very little of the actual text is devoted to this historical achievement. As a background source for teachers, this book gives a good account of Marconi's triumphs. However, because of its complex vocabulary and difficult writing style, it is not satisfactory for the Grade Five student.

Marconi: Father of Radio (Gunston, 1965)

This is an excellent book for adults or senior high school students on Marconi and the development of wireless communication. Written in a readable style, it traces the story of Marconi from his earliest experiments to his last days in Rome. The great event of wireless signals crossing the Atlantic Ocean for the first time is traced very well in Chapter IV, and is excellent background reading for teachers. For most Grade Five students, however, the book may be somewhat beyond their comprehension. The vocabulary is difficult, as many technical words relating to wireless and electricity are used.

Marconi: Inventor and Innovator (Edwards, 1971)

This work, prepared during the summer of 1971 by a student employed in Historical Research in Newfoundland, is a Department of Indian Affairs and Northern Development report on Marconi and his wireless experiments. Part of the report concentrates on the reception of the wireless signals across the Atlantic in 1901, with The Evening Herald, a local newspaper of that era, being quoted extensively. The report may be used as background information for the topic.

Marconi - Master of Space (Jacot and Collier, 1935)

A few pages of this book deal with Marconi's transatlantic experiments. Only general information is provided and at times events are exaggerated. The book may be of limited use to teachers if other sources are unavailable. Some difficulty may be experienced in locating this particular book.

Marconi: Pioneer of Radio (Coe, 1943)

This book discusses Marconi's early experiments and the part he played in the development of world-wide wireless communication. Although

the factual information provided in this book appears to be accurate, conversations between Marconi and his fellow workers are contrived, and weaken the account. The illustrations at the beginning of each chapter are poorly drawn, and the vocabulary is too technical for most Grade Five students. The chapter on the reception of the first transatlantic wireless signals may be a source of information for teachers.

Marconi: the Man and his Wireless (Dunlap, 1971)

In a chapter entitled "The First Transatlantic Signal" a very good account is given of Marconi's historic experiment. Preparations for the test, the crude apparatus used, and the various problems experienced are all written about in detail. This is a very good source for teachers and for most students. The vocabulary, however, tends to go beyond the Grade Five level. Some difficulty might be experienced in obtaining this source.

My Father, Marconi (Marconi, 1962)

This book not only recounts the scientific achievements of Guglielmo Marconi but also gives an intimate portrait of his personal life. His reception of the first wireless signals across the Atlantic is detailed very well and this account would serve as excellent background material for teachers. As an adult biography, the reading level of this book is above that of most elementary students.

Old Wires and New Waves: the History of the Telegraph, Telephone and Wireless (Harlow, 1936)

This book traces the development of the telegraph, the telephone and wireless. It is scientific in nature and contains many technical terms. A rather brief account is provided of the first signals sent by wireless across the Atlantic Ocean. It is a poor source for both

students and teachers, and may be very hard to obtain.

The Oldest City: the Story of St. John's, Newfoundland (O'Neill, 1975)

In a chapter entitled "The Trade of Words", the writer gives a very brief and general account of Marconi's exploits in St. John's. While the account does provide a succinct summary of this historic experiment for the teacher, students might have difficulty with it. This is an adult history book and the level of the language is well above that of most Grade Five students.

Signal Hill: an Illustrated History (Zierler and Mustard, 1982)

This brief history has a small section dealing with Marconi. It may be of some value to teachers as background material, since it provides the basic account of the first wireless signals received from England. The vocabulary, however, may be too advanced for Grade Five's. The accompanying photographs may be of value.

Signal Hill National Historic Park (1959)

This booklet covers the basic facts of Marconi's achievement on Signal Hill. As with other sources mentioned above, the vocabulary used may be beyond the Grade Five level. This booklet is also difficult to obtain.

A Structural and Narrative History of Signal Hill National Historic Park and Area to 1945 (Candow, 1979)

This manuscript, available from Parks Canada, contains an excellent account of Marconi's achievement in St. John's. The writer provides a brief biographical sketch of Marconi, and covers in detail his preparation for, and his carrying out of his transatlantic wireless experiment. It is an excellent source of background material for the teacher. The level of the vocabulary used, however, may preclude the

use of this history by the Grade Five student.

A Voice From Afar: the History of Telecommunications in Ganada (Collins, 1977)

Marconi's reception of the first wireless signals across the Atlantic is given little space in this history. The preparations for this event and the actual reception of the signals in Newfoundland is covered primarily in summary form. As very little detail is provided, this book may be inadequate as background information for teachers. It may be of some value to Grade Five students if other sources are unavailable.

"We Love Thee, Newfoundland" (Graham, 1979)

This biography of one of Newfoundland's governors includes a very short chapter entitled "Marconi" which begins with the inventor's arrival in Newfoundland. The author briefly summarizes Marconi's visit to St. John's and calls his achievement there "one of the most important events in Newfoundland's history". Written for adults and providing limited information, this source would not be satisfactory for most elementary grade students.

Wireless at Sea: the First Fifty Years (Hancock, 1950)

This is a history of the development of wireless communication at sea. Only a very short account is given of Marconi's first transatlantic signals. This account, accompanied by four photographs of the event, is basically the same as in the other sources cited. It could be used as general background information for teachers. However, most Grade Five students would have difficulty understanding the technical vocabulary.

Wireless Over Thirty Years (Vyvyan, 1933)

Essentially a history of wireless communication, this book has

several pages recounting the first transatlantic wireless experiments. It may be of value for the teacher to use as background information, if other sources are unavailable. For students, however, this book is not a good source because much of it would be beyond their level of understanding.

Articles from journals and newspapers

"Fessenden and Marconi: the two Great Pioneers of Radio and their Canadian Connections." (Labreche, 1981)

This article provides a brief account of Marconi's life and work compared with that of the Canadian scientist, Reginald Fessenden, who also did pioneer work in wireless and radio. As some incorrect information is given in this account, this article should be used only in conjunction with other sources. The article may be useful instead for the accompanying photographs.

"Guglielmo Marconi" (1903)

This article is essentially concerned with the development of wireless telegraphy, and deals briefly and generally with Marconi. It is unsuitable for both teachers and students for a number of reasons: the work is difficult to obtain; it has an unfamiliar writing style; the vocabulary is difficult; and it contains incorrect information.

"Marconi in Newfoundland" (1902)

This is an excellent account as given by Marconi to the Times representative of the reception of the first signals in Newfoundland from Poldhu, England. Since it is available only on microfilm, it is not easily accessible for most teachers or students.

"The Marconi Transoceanic Experiments" (1902)

Marconi's reception of the first transatlantic wireless signals

from Poldhu, England is well covered in this rather comprehensive account. This technical article discusses the difficulties that Marconi experienced, and speculates upon his plans for the future. As the literary style is dated, the article may be of little value at the Grade Five level. It is also difficult to acquire.

"Marconi's Great Discovery: First Trans-Atlantic Wireless Signals were Received at Signal Hill" (1947)

This lengthy article provides a summary of the development of wireless communication. It features a biographical sketch of Marconi, and deals in detail with his experiments in Newfoundland. It may be of use as background information for teachers, but it may be too difficult for elementary students. Also, it is not easily accessible for most schools.

"Signal Hill" (1979)

The role that Signal Hill has played in the history of St. John's is covered in this article. Marconi's historic achievement is briefly discussed. As very few details are provided, this account is not an adequate source for the teacher or student.

"Transatlantic Wireless Telegraphy: Marconi's Successful Experiment" (1902)

Four large photographs accompany this brief account of Marconi's amazing success in Newfoundland. While this source may be valuable for the pictures associated with the first transatlantic wireless signals, it may be very difficult to obtain for most teachers and students.

Non-Print Materials

Upon investigating the existence of non-print materials the researcher discovered two audio-tapes produced by School Broadcasts, Department of Education.

Marconi (Newfoundland School Broadcasts, 1962).

This audio-tape, although an interesting account of Marconi and the first wireless signals across the Atlantic in 1901, contains a number of historical inaccuracies which lessen the value of the information. The tape indicates that the signals were received in Cabot Tower on December 9, 1901, at three o'clock (local time) and were heard by both of Marconi's assistants. These facts are incorrect, as indicated by other writers on Marconi. (Gunston, 1965; Jolly, 1972; Duniap, 1971).

The tape also maintains that the signals were heard clearly and unmistakably on that day, and again on December 10. History recounts that the signals were not clear, but in fact were barely perceptible. Only the trained ear of Marconi and his assistant could distinguish the signals from the great amount of static present. Because of these inaccuracies, the researcher felt that this tape is not a good source for teachers or students.

Wireless in Newfoundland (Newfoundland School Broadcasts, 1962)

Dealing generally with the early days of wireless, and specifically with Marconi's reception of the first wireless signals from across the Atlantic, this audio-tape also contains historical inaccuracies. It treats the reception of the first wireless signals in a dramatized manner. The tape records that many people were present when the first signals were received, and that there was much rejoicing and backslapping among the group after the signals had been received sharp and clear.

These signals are reported to have been received in Cabot Tower. Other writers (Gunston, 1965; Jolly, 1972; Dunlap, 1971) clearly show that this information is inaccurate. For this reason, the researcher rejected this audio-tape as an instructional device.

The material described above comprises a sample of the items examined by the researcher to determine whether or not there are materials available that may satisfy the needs of Grade Five teachers for information on Marconi and the reception of the first wireless signals across the Atlantic. After thorough examination of these materials, it was concluded by the researcher that none is directed specifically at the age level of Grade Five students, and that none can be easily modified or adapted for this grade level.

Rationale for Development of Materials

Having established that a need for instructional materials on Marconi and the reception of the first wireless signals across the Atlantic did exist, the researcher pursued the first of the three possible solutions to the problem. The researcher first engaged in a thorough search for materials that already exist on this topic. This search revealed that, while a number of print materials still exist, they were originally intended for adult readers. They were general in nature, technical in content, and are not suitable for instruction in Grade Five history classes in Newfoundland schools. The search also revealed that virtually no non-print materials exist on this topic, with the exception of two audio-tapes that are historically inaccurate. The researcher rejected these recordings believing that they should no longer be used with Grade Five students.

With respect to the second solution - that of modifying existing materials - the researcher was of the opinion that none of the biographies of Marconi or histories of the Marconi Company could easily be adapted for the Grade Five level. Most are too detailed and technical, and may be difficult to modify. None was written specifically for the Grade Five student.

Therefore, since no suitable materials exist, and since none may be readily modified for the average Grade Five student, the researcher was convinced that the rationale existed to pursue the third solution to the problem. A supplementary instructional package would be produced for the Grade Five Level. This would be entitled: "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals".

Outline of the Development Process

To develop the instructional unit, the researcher adopted a model which served as a guide and as a broad outline for the development process. Figure 1 represents this development process.

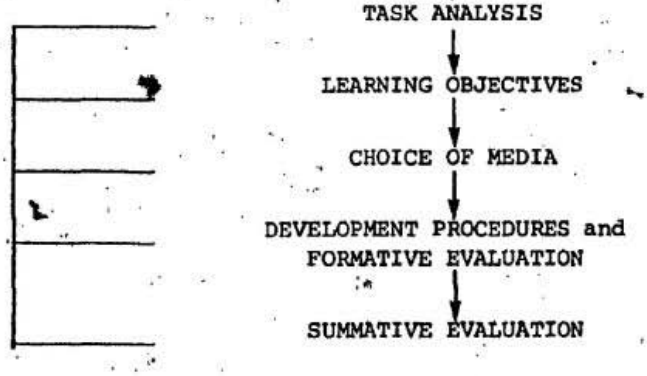

Figure 1. Instructional Design Model

The first stage of the development model has been described in previous pages (Chapter II). The next step entailed an investigation of the characteristics of those for whom the instructional package was to be prepared. This is reported in the chapter entitled "Learner Analysis".

From the various media that might possibly be used, the most appropriate was chosen. A description of this procedure is given in the chapter "Rationale for Choice of Media".

Throughout the process of producing the package, evaluation and revision were conducted as reported in the chapter on "Formative Evaluation". The final evaluation appears in the chapter headed "Summative Evaluation".

CHAPTER III

LEARNER ANALYSIS

The students for whom the instructional unit was developed are the Grade Five students of Newfoundland elementary schools. As a group, these students undoubtedly possess certain characteristics, any of which would make them different from other grades in the school. They will obviously differ in age, in achievement level, in their attitudes towards their studies, in their experiences with media and in their relationships with their teachers.

However, little information can be found in the research literature concerning the nature of these students. Below is a description of their characteristics with respect to age, maturity, achievement and attitude. This description is partly based on the information available from contacts with teachers, from the researcher's own experience as a teacher, and from information provided by the Newfoundland Department of Education.

Age

According to the Division of Information, Statistics and Publication of the Department of Education in Newfoundland, the majority of students in Grade Five in Newfoundland elementary schools range in age from nine to eleven years. The mean chronological age would, therefore, be ten years.

These records maintained by the Department of Education are compiled from the annual general returns submitted by each school in the province. A further breakdown on these ages was not available from the Department of Education statistician.

Maturity

No records were available from the Department of Education on the maturity levels of Grade Five students in the province. An official of the Department of Education recommended, however, that the researcher contact individual schools or school boards for such information. The researcher contacted several Grade Five teachers and guidance counsellors, and the information received may be summarized as follows: in the majority of cases Grade Five students are basically mature enough for their grade level. Only in a few cases are students not mature enough nor ready to handle the Grade Five programme of studies. In schools where such intelligence tests as The Peabody Test of Vocabulary, the WISC and the Stanford-Binet Test have been administered, the results reveal that a normal relationship exists between the mental and chronological ages of the students.

Achievement

Information available from the Division of Instruction, Department of Education, revealed that the achievement levels of students in Grade Six in 1976 were below the national average on the Canadian Test of Basic Skills. These students registered at only the thirty-second percentile. It must be recognized, however, that the 1976 results are now seven years old. It is possible that Newfoundland schools may have improved since then, or that the national average may have declined. In light of this, not too much should be assumed from these results.

The Canadian Test of Basic Skills has not been administered to Grade Five students in Newfoundland. However, one researcher in this field feels confident that the above finding for Grade Six can also be generalized to the Grade Five students (Nagy, 1981).

Several Grade Five teachers consulted by the researcher felt that most students in Grade Five are suited for that grade level. Furthermore, these teachers stated that in the majority of cases, the achievement level of Grade Five students was average, and met standards set by the schools.

Attitudes

With regard to the attitudes of students in the elementary schools in Newfoundland, no statistical evidence was available to the researcher, as no studies related to that subject could be found. In lieu of such evidence, two general assumptions were made by the researcher, based on the opinions and statements of Grade Five teachers.

It was assumed by the researcher that the effectiveness of an instructional unit as teaching material will be determined in part by the attitudes of the learners towards the various programmes of study offered by their school. In the Social Studies Programme, for example, the instructional unit will be more effective with students holding positive attitudes than with students holding negative ones.

Also, the effectiveness of an instructional unit as teaching material will be affected by the attitudes of the students towards instruction by means of multi-media techniques. The instructional unit will be more effective if students have positive attitudes towards instruction which uses a mediated approach.

The opinion of these Grade Five teachers was that their students generally have very positive attitudes towards mediated instruction, especially since the history portion of Social Studies in Grade Five has little instruction in mediated form.

Summary

The learner analysis has revealed that Grade Five students range in age from nine to eleven years. Generally, they are mature enough for their grade level and have little difficulty with the Grade Five programme of studies. They meet the standard of achievement set by their schools, although this may be lower than the national average. Also, in most cases, Grade Five students hold positive attitudes towards mediated instruction.

CHAPTER IV

TASK ANALYSIS

The first purpose of the task analysis was to help the researcher organize the information which was to be included in the instructional package. This instructional package was developed to provide instructional materials relating to the reception of the first wireless signals by Guglielmo Marconi. In the task analysis it was necessary to divide the learning that was to take place into sub-tasks, or sub-headings that included all vital elements of information included under the main topic.

A second purpose of the task analysis was to assess the present level of achievement of the intended learners. The researcher assumed that only normal Grade Five competencies would be necessary for learners exposed to the instructional package.

The third purpose of the task analysis involved breaking down the identified sub-tasks into learning objectives, or learning outcomes.

The fourth purpose of the task analysis was to examine the package and identify and eliminate any irrelevant information which was inadvertently included in the instructional package.

Entry Level

As a result of informal discussions with Grade Five teachers in St. John's and surrounding areas, the researcher assessed the entry level of Grade Five students. Initially, the researcher attempted to determine as accurately as possible these students' present level of knowledge of Marconi's reception of the first wireless signals across the Atlantic, their interest in Newfoundland history, and their familiarity with

mediated instruction.

It was the general consensus of the teachers consulted that Grade Five students:

1. have just begun the study of Newfoundland history, and consequently have little knowledge of specific events;
2. are only vaguely familiar with the name Marconi, and know little of the experiments on Signal Hill;
3. are generally familiar with the filmstrips, slides, audio-tapes and other media used in the classroom.

Therefore, a requirement for the development of materials for Grade Five students made it necessary for the researcher to assume that no specific learner entry behavior was necessary, other than the knowledge expected of the average Grade Five student.

Task Analysis

The task analysis involved the sub-dividing of the main topic into a series of headings. From these, a diagram was constructed which enabled the researcher to ensure that all vital elements of the topic were included in the instructional package. Figure 2 represents the main task or goal of the whole project on the reception of the first wireless signals across the Atlantic, and divides the story into smaller elements, or sub-units of information to be communicated to the intended learners.

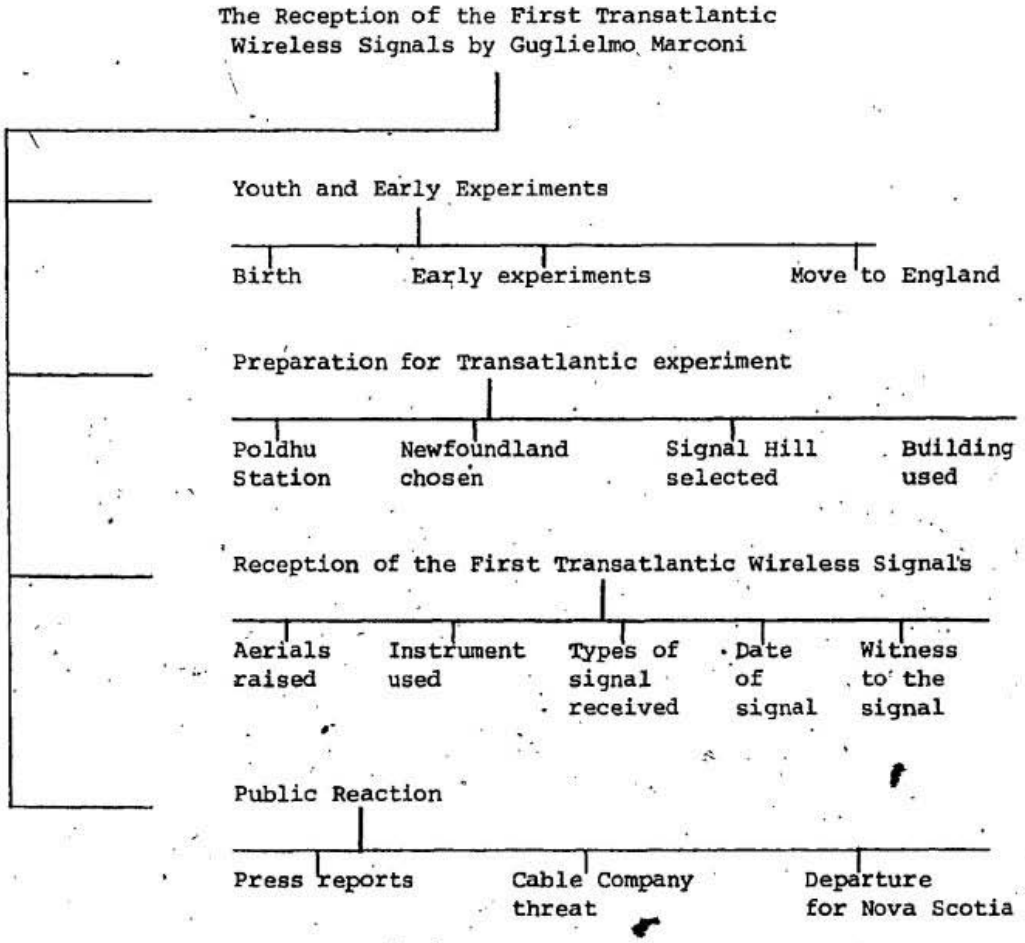

Figure 2 Marconi's Reception of the First Transatlantic Wireless Signals

Learning Objectives

The purpose of stating the learning objectives, or intended learning outcomes of an instructional unit being developed was to describe clearly the performance expected of the intended learners at the close of the instruction. In addition, a criterion for success of the whole instructional unit was required.

The criterion for success, that is, the performance objective, for this instructional unit was determined to have been met if 75% or

more of the posttest questions, which were derived directly from the specific learning objectives, had been successfully completed by 75% or more of the Grade Five students.

After consultation with Grade Five teachers the following learning objectives were established. These objectives have been sub-divided into three categories: essential objectives; important objectives; and desirable objectives. The first category covers knowledge which the researcher deemed essential for students to know; the second category covers knowledge which the researcher deemed important for students to know; while the third category covers knowledge which the researcher deemed desirable but not really necessary for students to know.

Category ONE - Essential Objectives

After viewing the slide-tape presentation, the learner should be able to identify correctly:

1. the kind of experiment carried out by Marconi at St. John's, Newfoundland.
2. the site at St. John's which Marconi selected for his experiments.
3. the name of the country where the first signals came from.
4. the year in which the first transatlantic signals were received.
5. the reason Marconi could not continue his work in Newfoundland.

Category TWO - Important Objectives

After viewing the slide-tape presentation, the learner should also be able to identify correctly:

6. the method Marconi used to raise his aerial wires when the signals were received.

7. the type of signal that Marconi hoped to receive from across the Atlantic.

8. the building on Signal Hill in which Marconi received the first wireless signal.

9. one reason why Marconi selected Newfoundland for his experiment.

10. the province to which Marconi went after he left Newfoundland.

Category THREE - Desirable Objectives

After viewing the slide-tape presentation, the learner may be able to identify correctly:

11. the name of the country where Marconi was born.

12. the location in Newfoundland near St. John's where Marconi hoped to build a permanent wireless station.

13. the name of Marconi's assistant who also heard the first trans-atlantic wireless signals.

14. the instrument used by Marconi to hear the signals from England.

15. the reason why Marconi did not announce his news to the Press immediately.

Summary

The task analysis then, served as an aid in the organization of the instructional package. It permitted the researcher to assess the entry level of Grade Five students, to divide the main topic into sub-headings for more efficient learning, and to identify the desired learning objectives. It also permitted an examination of the information provided so that irrelevant details could be eliminated.

CHAPTER V

RATIONALE FOR CHOICE OF MEDIA

The instructional package entitled "Signals across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" is a multi-media package developed for use with Grade Five students in the Social Studies programme in Newfoundland schools.

An initial argument for developing a multi-media instructional package rather than printed material was that students were already exposed to one source of printed material, i.e., their textbook. Non-print materials would provide variety for both students and teachers, thus hopefully increasing teaching effectiveness and enhancing retention and motivation among students.

However, before a decision was made to adopt the multi-media format for the development of this resource package, supportive evidence was sought that this format would provide a beneficial method of instruction for elementary school students. A review of existing relevant literature was undertaken; a survey of selected Grade Five teachers was taken in which a questionnaire indicating their choice of media was collected; and consideration was given to the cost and convenience of producing an instructional package.

Review of Literature

Over the past few years, numerous research studies have been carried out on the use and effectiveness of media in instruction. The researcher examined a number of these studies and found that a considerable number of them supported the use of media for instructional purposes.

In one of the earliest studies in this field, Rulon (1933) conducted a classic experiment at Harvard University to determine what effect integrating specially designed science films might have on student learning of both rote (factual) items and educative (application) type problems. This study produced startling results in favour of the film-enriched instructional approach. Results showed a 14.8 per cent superiority in immediate learning of rote items and a 24.1 per cent superiority in immediate learning of educative items for the text-plus-film groups over the text-only groups. In retention of information after three and a half months, the results indicated a 33.4 per cent and a 41 per cent superiority on "rote" and "educative" items, respectively, of the text-plus-films groups over the text-only groups.

Kelly (1961) conducted a comparative study with first graders at Michigan City, Indiana, to study the effect of filmstrips in teaching reading. He found that students who used filmstrips in their reading did significantly better on the Gates Primary Reading Tests in word recognition (.01 level of confidence) and sentence reading (.05 level of confidence). Teachers involved in this study reported that filmstrips improved student interest, stimulated class discussion, helped to fix basic vocabulary, encouraged the timid child, and helped in phonic and structural analysis.

In a study carried out at the University of Texas, Chance (1960) and two other instructors of engineering descriptive geometry studied what possible effect the additional use of two hundred specially prepared overhead transparencies would have on student learning. In comparing the use of transparencies plus the traditional approach with the lecture-discussion approach, covering identical content, the researchers concluded:

1. the groups which had the added use of the transparencies did significantly better on mean final course examination scores and final course grades (.05 level of confidence);
2. the three faculty members agreed unanimously on the desirability of using transparencies in their teaching;
3. use of the transparencies resulted in an average saving of fifteen minutes per class period;
4. students reported overwhelming perference for instruction using transparencies.

Peeck (1974) reported that the addition of pictorial presentations aided story comprehension by fourth graders. Seventy-one students, aged nine and ten, in three schools read an adapted version of a "Rupert Bear" story. Half the students in each school were presented with an illustrated text, while the other half read the story without pictures. Students in the first school were tested for retention immediately after they had read the material; in the second school, testing took place one day later; while in the third school, testing was carried out one week later. Results indicated that students exposed to both pictures and text scored significantly better than subjects exposed only to the text.

Romano (1955) conducted a study to determine what learning differences, if any, the integration of 16mm films and projected still pictures would make in the learning of science vocabulary in the fifth, sixth and seventh grades. Results from this study revealed:

1. that all experimental groups using the films and projected pictures evidenced larger gains in vocabulary than the control groups in all units of study;

2. all teachers involved pointed out the intrinsic value of the use of audio-visual materials in creating more effective teacher-learning situations;

3. subjects participating in the study indicated that an instructional programme using many audio-visual materials enhanced the learning situation.

In a study to evaluate the effect of the use of slide/tape units as an instructional aid for teaching laboratory technique, Hill (1973) worked with college students in a general chemistry course. Units were evaluated under three conditions of student use. Condition One was required viewing in a resource centre prior to entering the laboratory; Condition Two was optional viewing before entering the lab; while Condition Three was viewing in the laboratory during presentation. Tests for evaluation of improvement in laboratory technique indicated a significant improvement at the .05 level for the three experimental sections over a control section which did not view the slide/tape units.

In a doctoral study at the University of Maryland, Hosley (1974) compared the two methods of instruction in an environmental education unit on the balance of nature concept. One method utilized a field, or out-of-door approach while the second method consisted of a three-screen slide-tape presentation of the same topic. One hundred Grade Five students from Prince George's County (Maryland) Public Schools were selected at random and divided into four treatment groups consisting of twenty-five students each. Group One received no instruction; Group Two viewed the slide presentation; Group Three used the field approach; and Group Four received both the slide presentation and the field trip. A retention test was administered after the instructional unit was completed. Results

indicated:

1. that students receiving the slide presentation scored as high as those students participating in the field approach;
2. students viewing the slide presentation scored higher than students receiving no instruction;
3. students receiving both instructional methods scored highest.

Other experimenters have also been active in studies concerning the use of media in schools. Wendt and Butts (1960) carried out a study in which they used a series of fifty-four films in the Grade Nine classes in seven schools. In each school, one teacher taught both an experimental and a control group. The Experimental group viewed the films while the control group did not. The Study revealed that it took the control group one year to cover the same subject material that the experimental group covered in one semester. In this case, however, a criterion test administered at the end of the instructional period showed no significant difference between the control and the experimental groups.

Tullen (1971), in a study carried out at Columbia University, worked with students in a first year Physics course. Because of a reading difficulty resulting in problems acquiring new information and concepts from the textbook, an instructional package was developed to provide aurally and visually information found in the text. The package included a two-part film, a thirty-two page laboratory guide and a six item pretest and posttest. The lab work was carried out between the two parts of the film. An analysis of test results indicated that the students learned better from the film and the hands-on laboratory activity than from the text.

In reporting a study to assess student and teacher attitudes towards media carried out several years ago, Schlack and Kofel (1974) wrote that one of the most significant contributions instructional media can make to the classroom is the creation of an enriched, stimulating environment through the use of multi-media in classroom activities. A questionnaire to assess student attitudes towards using media in the classroom was administered to eighteen classes of fifth graders, for a total of 461 students. A similar questionnaire was administered to the eighteen classroom teachers.

Student responses to questionnaire items related to interest demonstrated that students felt that media make a lesson more interesting. Several reasons for this attitude were revealed through the questionnaire. Increased student interest was partially attributed to: the ability to see what is being discussed; the ability to have hands-on experience; greater understanding through the use of media; more enjoyment, fun and entertainment as a result of media being utilized.

Classroom teachers expressed similar attitudes. They observed that:

1. student interest increases when varied media are used in the presentation;
2. student interest in further pursuit of the subject increases when media are used;
3. student understanding increases;
4. student enjoyment increases;
5. when media are available, students frequently use them in independent study.

Finally, most studies tend to agree with John Moldstad (1974) who concluded that twenty years of decision-oriented media research have produced significant evidence to justify the following claims where instructional technology is carefully selected and used:

1. Significantly greater learning often results when media are integrated into tradiational instructional programmes.
2. Equal amounts of learning are often accomplished in significantly less time using instructional technology.
3. Multimedia instructional programmes are usually preferred by students when compared with traditional instruction.

The majority of research studies, then, support the use of media in instruction. However, before the researcher could make a decision as to the kinds of media to be included in the instructional package "Signals Across the Waves: Marconi's Reception of the First Trans-atlantic Wireless Signals", consideration had to be given to the preferences of teachers and to the cost and convenience of production.

Teacher Preference

Once the decision had been made to produce instructional materials on Marconi and the reception of the first wireless signals to cross the Atlantic, a questionnaire was mailed to a number of Grade Five teachers across the province to determine how effective certain types of media were perceived to be for instructional purposes, and how practical it would be for teachers to actually use the various types of audio-visual softwa Teachers were also requested to indicate their choices for the three most desirable forms of instructional package, and to rank their choices first, second, and third. This questionnaire (Appendix C) was sent to thirty-

five Grade Five teachers. Twenty-seven questionnaires were returned.

Teachers' responses to questionnaire items indicate that combinations of media were perceived as being more effective for teaching purposes than a single medium. All the combinations of media listed on the questionnaire were considered to be very effective for instructional purposes. These included: slides and tape; slides with script; filmstrip and tape; filmstrip and script; booklet, slides and script; and booklet filmstrip and script. Media thought by teachers to be of only average or little effectiveness included: audio-tapes only; slides only; filmstrips without scripts or tapes; video-tapes, and booklets. The 16mm film was not listed on the questionnaire because of the cost and technical difficulty that would be involved in its production.

With respect to how practical it is for teachers to use the various forms of media, teacher responses on the questionnaire revealed that all types of media could be easily used in the classroom with the exception of the video-tape. This medium of instruction was rated as impractical because many schools throughout the province do not own video recorders. The booklet was also rated as impractical by a number of respondents. In this case, it may be that the booklet was considered to be for the use of the teacher and not the student. As such, it would be impractical to use with a large class.

The most desirable forms of instructional package ranked first, second and third by teachers responding to the questionnaire were:

1. filmstrip and tape; 2. slides and tape; 3. filmstrip and script.

Cost-Convenience Considerations

In addition to the results of the research studies examined and the

preferences expressed by teachers, the researcher gave consideration to two other criteria in selecting the media to be used in the instructional package. These were the cost and convenience of producing each medium.

The researcher was aware that certain media of instruction are much more expensive to produce than other media. Sixteen millimeter films, super eight films and video-tapes, for example, are expensive items to produce, mainly as a result of the equipment and technology required. On the other hand, items such as thirty-five millimeter slides, audio-tapes in cassette form and overhead transparencies are very economical to develop. Moreover, any production changes required in the latter forms are not costly to make.

As well, the actual production of some media forms is technically difficult and requires rather sophisticated production equipment. Sixteen millimeter films are a prime example, as are video-tapes. Production changes are difficult and cannot be easily made. The production of thirty-five millimeter slides and audio-tapes, however, is a rather simple and straightforward process. The production equipment is easily operated and corrections can be readily made. The order in which slides are presented may also be re-arranged at any time and they may be constantly updated. Filmstrips, on the other hand, do not enjoy this advantage, for once production is carried out, no further changes are possible

Conclusion

Having examined several research studies in this area, and having given consideration to the preferences of teachers as well as to the cost and convenience of production, the researcher concluded that the best forms of media for this project were thirty-five millimeter slides coupled with audio cassettes. The slides format allowed the possibility for later conversion to a filmstrip format for distribution to the schools.

CHAPTER VI

DEVELOPMENT PROCEDURES AND FORMATIVE EVALUATION

Once the researcher had decided to produce a slide-tape programme, the first step in the production was the writing of the script. The initial draft was revised a number of times as the researcher tried to cover the basic information for a Grade Five level. Several Grade Five teachers were asked to read the script and ensure that the vocabulary was not beyond that of the average Grade Five student. The script was also read by two media specialists to confirm that the information being provided was clear and concise.

The next step was to match the script with visuals. The researcher had sought out as many old photographs of Marconi as possible from a variety of sources, including the Marconi Company in Chelmsford, England. In cases where photographs could not be matched to the script, a decision was reached by the researcher, in consultation with a media specialist, to have illustrations or graphics produced. These would be based on existing photographs of that era and would blend in with the old photographs.

Slides were next made of the photographs and graphics, and a preliminary recording was made of the script for both the formative evaluation and testing purposes. The formative evaluation was conducted over a two week period in the fall of 1983 through discussions with a content specialist, two learning specialists, two media specialists and a small group of students.

Evaluation by Content Specialist

The content specialist for this project was the Area Interpretation

Officer for Historic Parks and Sites in Newfoundland. She is also the Officer-in-Charge of Signal Hill National Historic Park and consequently is very familiar with Marconi and his achievement in Newfoundland. The role of the content specialist was to verify the historical accuracy of the information contained in the package and to suggest possible changes. The content specialist was very pleased with the overall production of the instructional package and offered a few short comments for a couple of minor changes in the script. These changes were primarily for clarification purposes and were accordingly made by the researcher. No historical inaccuracies were noted by the content specialist.

Evaluation by Learning Specialists

The two learning specialists were Grade Five teachers at an elementary school in St. John's. Both had considerable experience in teaching at that level. Each teacher previewed the slide-tape presentation to determine whether the materials were suitable for students at the Grade Five level. Both learning specialists highly approved of the package and judged the materials to be well suited for use with elementary school students.

Questioned as to whether the instructional programme was too long for the Grade Five level, both specialists indicated that it was not. One of the teachers, suggested, however, that a glossary of the more difficult words used in the presentation be included in the Teacher's Guide. The researcher agreed with this suggestion and made that addition to the guide. The learning specialists found no changes that were necessary to be made in the instructional package itself.

Evaluation by Media Specialists

The two media specialists for this project were faculty members of the Division of Learning Resources at Memorial University. The media specialists previewed the package to examine the design aspects and the technical quality of the non-print materials. After examination of the materials, a discussion was held between the media specialists and the researcher. Several points of concern were brought up and several recommendations were made by the media specialists.

The media specialists recommended that several of the slides be reproduced as faint light spots were visible on the lower edges. It was recommended also that two slides - one of Marconi's diary entry and one of Mr. T.J. Murphy, Minister of Marine and Fisheries - should be retained in keeping with the historical nature of the production. The specialists further suggested that the sound of a ticking clock should not be used to indicate the passage of time, as it could be confused with the sound of the Morse Code signals which followed immediately after.

These recommendations were carried out by the researcher and new slides were reproduced. As a typographical error had been detected in the script after the initial recording, a second recording was made in which any errors reported by the media specialists were corrected.

Evaluation by Learners

The formative evaluation was completed by using the package with a representative sample of Grade Five students. The purpose of using the package with a group of learners was to determine what the learners' reactions to the package would be. The learners viewed the slide-tape programme and afterwards held a discussion with the researcher. The

discussion centered around questions regarding the content and technical aspects of the production, as well as the students' attitudes towards it. In the discussion the students were encouraged to be open and honest.

The learners enjoyed the programme; all of them agreed that it was interesting and easy to understand. No changes were considered necessary by the learners. This being the case, the researcher was ready to proceed to the final testing stage. The package was made ready for formal evaluation.

CHAPTER VII

SUMMATIVE EVALUATION

Summative or formal evaluation is the process of measurement or proof required to demonstrate that the stated learning objectives of an instructional unit have or have not been transmitted to the intended learners by that instructional unit.

The following is a description of how the evaluation for this instructional package was carried out. The description includes a discussion of the comparisons made between groups, indicates how the learners were selected and provides an analysis of results.

Design

The results obtained from testing the instructional package "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" were subjected to three types of evaluation. Initially, a comparison of means was carried out, followed by an examination of the percentage of students with items correct. Finally, an item analysis was conducted on the scores of the Experimental Group.

Comparison of Means

For the evaluation of the materials of this instructional package, a three group experimental design was used as shown in Figure 3. The Experimental Group was given a pretest, shown the instructional programme and given a posttest; Control Group I was given a pretest and a posttest, with the instructional programme not shown; and Control Group II was shown the instructional programme and given a posttest, with no pretest given.

	Pretest	Instructional Programme	Posttest
Experimental Group	x	x	x
Control Group I	x		x
Control Group II		x	x

Figure 3

Experimental Design

The researcher felt that this three group design is among the best for comparing experimental treatments. As Kerlinger (1973) indicates, it allows three statistical comparisons: it permits the comparison of difference in means between the experimental group and a control group; it compares before and after scores and it provides a way to test possible interactive effects due to the pretest. By comparing the posttest means of the Experimental Group and Control Group II, the amount of sensitization produced by the pretest can be determined.

For the analysis of the results, three means were compared. The pretest mean of the Experimental Group was first compared with the pretest mean of Control Group I. This analysis enabled the researcher to compare the entry knowledge of the two groups. The researcher was concerned with the extent to which the two groups differed in their knowledge of the instructional material.

A second comparison was made between the Experimental Group and Control Group I with respect to their mean gain scores, that is, the difference between the pretest score and the posttest score of each student in each of the two groups. This test helped to determine the

amount of knowledge that can be attributed to the actual instruction, and that which may have been gained from the pretest.

A final comparison was made of the mean posttest scores of the three groups. This analysis was carried out to determine whether the administration of the pretests to the Experimental Group and Control Group I had an influence on the outcome of their posttests.

Percentage of Students with Items Correct

This analysis was conducted to determine the level of achievement obtained by the Experimental Group after viewing the slide-tape presentation (the instructional programme). The posttest scores of this group were examined to determine the percentage of students in the classes for various percentage of items correct. Calculations were made, for example, to determine what percentage of the students answered 100% of the items of the posttest correctly, 90% of the items correctly, 80% of the items correctly and so on.

This measure not only determined how well the students had performed but indirectly revealed the extent to which the objective had been achieved. The researcher had reached a decision before the testing was carried out that if 75% of the students answered 75% of the items correctly, the learning experience of the students would be considered a success as indicated by this measure.

Item Analysis

This form of analysis applied to the scores of the Experimental Group only was intended to show the growth of learning or improvement in performance which had taken place for each pretest-posttest item, that is, the extent to which each objective was met as measured by the performance on each item.

Three tests were applied: a test to determine whether the difference between the number of correct responses on the pretest and those on the posttest could have been attributed to chance; a test to show the percentage of successful students on the posttest; and a test to indicate the amount of success which could be attributed to the instruction.

Construction of Pretest and Posttest

Objective examination questions were written in a pretest-posttest format derived from a set of specific learning objectives (see p. 29). The pretest (Appendix A) consisted of twenty-five items subdivided as follows: five Fill in the Blanks, ten Multiple Choice and ten True or False questions. The posttest (Appendix B) was similar to the pretest, except that the order of the item presentation was varied. Each test item corresponded to a specific objective of the instructional material. Table 2 indicates the number of the item wherein each objective is tested both on the pretest and on the posttest.

Table 2

Objectives Matched with Items on the Pretest and Posttest

Objective No.	Pretest Items	Posttest Items
1	3 7	1 6
2	1 10	2 7
3	2 6	4 8
4	5 8	3 9
5	4 11	5 10
6	9 18	11 16
7	12 16	12 17
8	14 19	13 18
9	15 17	19
10	13 21	15 20
11	20	21
12	23	22
13	22	23
14	25	24
15	24	25

Teacher Questionnaire

The Teacher Questionnaire (Appendix D) was distributed to the Grade Five teachers who viewed the slide-tape presentation. This consisted of a number of open ended questions which permitted teachers to express their reactions as they wished. Four of the questions asked teachers their impressions of the technical aspects of the instructional package, while four other questions asked teachers what they thought of the teaching suitability of the materials. Teachers were also asked for an overall rating for the presentation and were encouraged to provide further comments or suggestions.

Selection of Subjects

The summative evaluation of the instructional unit was conducted with six Grade Five classes at three elementary schools, two of which were in St. John's, and the other a short distance outside the city. These classes were considered to be similar with respect to age, academic capabilities and other characteristics as described in the chapter on Learner Analysis (see p. 22). Two Grade Five classes in each school were combined to form a larger group so that the larger sample of students would provide a more valid indication of the effectiveness of the instructional unit.

Other than arrangements made by the researcher with the schools to combine the two classes into a larger group, no attempt was made to choose particular subjects for the experiment. Teachers of these classes indicated that, in their opinion, all classes were average Grade Five students.

Procedure

The researcher presented both tests and the instructional package.

Students were prepared with a simple explanation of the purpose of the pretest, and assumed that their scores would not be held against them or appear on any report card. This preparation was especially necessary in the case of Control Group I where the pretest and the posttest were given without the instructional unit being presented.

After the pretest had been completed and collected from all students, the slide-tape programme was presented. Once this was completed, the posttest was administered. During this time period, teachers were asked to complete the Teacher Questionnaire. As previously stated, the purpose of the Teacher Questionnaire was to determine the teachers' reactions to the technical design and the teaching suitability of the material.

Analysis of Results

Three groups were involved in the evaluation of this package: the Experimental Group; Control Group I; and Control Group II. Various statistical tests were utilized in the analysis of results: A comparison of means using pretest scores, gain scores and posttest scores; a breakdown of the percentage of students with items correct; and an item analysis using the scores of the Experimental Group. The findings from the evaluation of the instructional units are presented below.

Comparison of Means

Pretest Means. To determine if the Experimental Group and Control Group I (both of which received the pretest) were equivalent to begin with, the pretest means of both groups were first compared. A significant difference between the two groups would suggest that the groups were not equivalent in their entry knowledge of Marconi and his reception of the first transatlantic wireless signals. Insignificant differences between

the two groups would indicate that the two groups were similar in their knowledge of the topic. The results of the comparison of pretest means are shown in Table 3. In the table, N is the number of students in the group; M is the mean of the group; SD is the standard deviation and "t" is a test of the level of significance of the difference between the means.

Table 3

Comparison of Pretest Scores - Experimental Group and Control Group I

Group	N	M	SD	"t"
Experimental	59	10.31	3.55	1.36
Control Group I	45	9.42	2.90	

df = 102 $p > .05$

Table 3 shows a "t" value of 1.36 and $p > .05$. This indicates that the two pretest means were not significantly different. It was concluded, therefore, that the classes were similar in the extent of their knowledge of Marconi.

Gain Score Means. To determine if significant learning had occurred in the Experimental Group after receiving the instruction, the Experimental group and Control Group I were next compared in terms of their gain scores. The gain score is the difference between the pretest score and the posttest score of each student. The results of this comparison are shown in Table 4.

Table 4

Comparison of Gain Scores - Experimental Group and Control Group I

Group	N	M	SD	"t"
Experimental	59	11.41	4.05	15.97
Control Group I	45	0.58	2.39	
	df = 102		p < .001	

A comparison of the gain scores showed that a significant difference existed between the Experimental Group scores and those of Control Group I. This finding indicated that significant learning had occurred for the students receiving the instruction.

Posttest Means. To determine whether or not the administration of the pretest to the Experimental Group influenced the outcome of that group, the researcher analysed the posttest means of the three groups. These results are shown in Tables 5 and 6.

The mean of the posttest of the Experimental Group (which received the pretest, the instructional programme, and the posttest) was first compared with the posttest mean of Control Group I (which received the pretest and the posttest but no instructional package). Then the posttest mean of Control Group I was compared with the posttest mean of Control Group II (which received the instructional programme and the posttest but no pretest).

Table 5

Comparison of Posttest Means - Experimental Group and Control Group I

Group	N	M	SD	"t"
Experimental	59	21.71	2.32	20.22
Control Group I	45	10.04	3.57	
df = 102		p < .001		

Table 6

Comparison of Posttest Means - Control Group I and Control Group II

Group	N	M	SD	"t"
Control Group I	45	10.04	3.57	12.12
Control Group II	59	18.94	3.83	
df = 102		p < .001		

Both comparisons revealed a significant difference between each of the two groups: the Experimental Group performed significantly better than Control Group I, and Control Group II also performed significantly

better than Control Group I. This result was interpreted to mean that the administration of the pretest to the Experimental Group had no significant influence on the outcome of the posttest. Such an influence could have taken place if a significant difference had existed between the posttest means of the Experimental Group and Control Group I and no siginficant difference had been found between the posttest means of Control Group I and Control Group II.

The analysis of these two sets of means confirmed the conclusion from the analysis of gain scores that the presentation of the instructional package had indeed contributed significantly to the learning and that the administration of the pretest did not influence the outcome of the posttest.

The researcher, therefore, concluded on the basis of the various comparisons of means that: (i) no significant difference existed between the Experimental Group and Control Group I before the Experimental Group was presented with the instructional unit; (ii) the presentation of the instructional unit to the Experimental Group resulted in significant learning by this group; and (iii) the administration of the pretest to the Experimental Group did not have a significant sensitizing effect on the students.

Percentage of Students with Items Correct

Another indicator that significant learning had taken place in the group that received the instructional unit (the Experimental Group) was the percentage of students who had obtained various percentages of items correct on the posttest. As shown in Table 7, 93% of the students achieved 76% or more of the items correct on the posttest while only 7% achieved less than 76%.

Table 7

Experimental Group Results: Percentage of Items Correct on the Posttest

% of Students in the Experimental Group	% of Items Correct
3	100%
24	96% or more
47	92% or more
63	88% or more
69	84% or more
85	80% or more
93	76% or more
7	less than 76%

These figures show a high level of achievement on the posttest by the students in the Experimental Group, and demonstrate an acceptable level of performance for the instructional unit.

Item Analysis

To determine the extent to which the instructional programme had been successful in teaching the information on which each item on the posttest was based, the researcher examined separately each item of the posttest of the Experimental Group. This analysis also indicated indirectly the extent to which each objective was reached. These results are presented in Table 8.

Table 8

An Item Analysis of the Scores
Between the Pretest and the Posttest

1	2	3	4	5	6
Item	# of Successful Students		Difference Between Pretest and Posttest	# of Successful Students on Posttest	Success Index
	Pretest	Posttest	χ^2		
1	27	51	7.385**	.864	.750
2	34	52	3.767	.881	.720
3	17	45	12.645***	.763	.667
4	14	48	18.645***	.814	.756
5	4	40	29.455***	.678	.655
6	41	50	.890	.847	.500
7	19	44	9.921**	.746	.625
8	16	50	17.515***	.847	.791
9	13	48	20.082***	.814	.761
10	39	56	3.042	.949	.850
11	25	44	5.232*	.746	.559
12	16	56	22.222***	.949	.930
13	31	55	6.698**	.932	.897
14	5	49	35.852***	.831	.815
15	34	58	6.261*	.983	.960
16	31	54	6.224*	.915	.821
17	32	55	6.080*	.932	.852
18	29	52	6.531*	.881	.767
19	21	55	15.211***	.932	.895
20	15	49	13.235***	.831	.773
21	23	54	12.481***	.915	.861
22	34	54	4.545*	.915	.800
23	34	53	4.149*	.898	.760
24	39	55	2.723	.932	.800
25	25	57	12.488***	.966	.941

* p.< .05 ** P.< .01 *** P.< .001

In Table 8, Column 2 lists the number of students answering each question correctly on the pretest, while Column 3 indicates the number of students answering each question correctly on the posttest. The chi square (χ^2) shown in Column 4 is a measure of the extent to which the difference between the pretest score and the posttest score was due to chance. As shown in Table 8, there was a significant increase in learning by the students as demonstrated by the difference in the number of successful students on 21 of the 25 pretest-posttest items. Seven items were significant at the $p.< .05$ level, 3 items were significant at the $p.< .01$ level and 11 items were significant at the $p.< .001$ level. There was no significant growth in 4 items.

Column 5 of Table 8 refers to the percentage of students answering each question correctly on the posttest and as stated previously indicates the extent to which the given objective was reached. This measure was determined for each item by dividing the number of responses to the item on the posttest by the total number of responses possible. For example, for item 1, 51 students out of 59 (the total number) answered the question correctly, i.e., $51 \div 59 = 0.864$. This means that 86.4% of those who responded to the question on the posttest answered correctly, and thereby achieved the objective.

The percentage of correct responses to the items on the posttest ranged from 67.8% to 98.3%. These results indicated that for all the items except three (items 5, 7 and 11) 76% or more of the students answered the items correctly, demonstrating a high level of performance for the instructional unit. For the items covering objectives considered essential by the researcher (items 1 - 10) the percentage of correct responses to the items on the posttest ranged from 67.8% to 94.9%. On

only one item (item 5) did less than 75% of the students answer correctly. This could mean that this question was poorly stated, that the information was not made clear in the presentation, or that the question was too difficult. On the other items a high level of performance was achieved.

The Success Index presented in Column 6 of Table 8 is an indication of the extent to which the success on the posttest can be attributed to the instructional programme itself and not to prior knowledge as indicated on the pretest. This measure was calculated by dividing the difference between the number answering the pretest question and the posttest question correctly, by the sum of the difference between the number answering the pretest question and the posttest question correctly, and the difference between the maximum number of correct responses and the number answering the posttest question correctly.

The formula for finding the Success Index, therefore, was:

$$\frac{\text{number correct on posttest} - \text{number correct on pretest}}{(\text{number correct on posttest} - \text{number correct on pretest}) + (\text{maximum number of correct responses} - \text{number correct on posttest})}$$

For example, for item 10, 39 correct responses were recorded on the pretest and 56 on the posttest. The Success Index was calculated as follows: 56 - 39 divided by (56 - 39) + (59 - 56) which equals 0.850. This result means that 85% of the learning of the information for this item can be attributed to the instructional programme, and not to prior knowledge as indicated on the pretest. The Success Index ranged from .500 to .960. Only 6 items of the 25 did not show a success rate of 75% or more. The researcher concluded, therefore, that overall, the

instructional programme achieved an acceptable success rate.

Results of Teacher Questionnaire

The Grade Five teachers who viewed the slide-tape presentation returned very favourable responses. They agreed that overall the programme was very good, and that it was neither too long nor too difficult for Grade Five students. Because the questions were open ended and the responses consisted of various teachers' opinions, no table or chart tabulation was possible. The teachers, however, were pleased with the technical aspects of the programme and felt sure that it would be a valuable supplement for Grade Five Social Studies.

Conclusion

The purpose of the summative evaluation was to determine whether or not the learners had successfully acquired the information specified by the learning objectives as set forth earlier in this report. Analyses of the pretest and posttest results indicated that the learners had acquired the information on an acceptable level. The test items had been previously matched with the specific learning objectives as shown in Table 2.

Since the information of the slide-tape presentation "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" had been successfully communicated to the learners who were described earlier in this report as average Grade Five students in Newfoundland schools, the instructional unit as a whole was a successful production and met the general project object of producing needed and useful supplementary materials for the Grade Five Social Studies curriculum.

CHAPTER VIII

CONCLUSIONS, RECOMMENDATIONS, IMPLEMENTATION

After the instructional unit had been completed and evaluated, the researcher was able to draw a number of conclusions and was prepared to offer several recommendations regarding the production of other instructional material for the study of Newfoundland history in the Grade Five Social Studies programme.

Conclusions

Since a survey of the existing literature showed that very little instructional material on Marconi's achievement in Newfoundland was available at the elementary school level, the need for the development of such an instructional unit was established. The characteristics of the intended learners were then analyzed, and the expected learning outcomes determined. The type of media to be used for the instructional unit was selected and a rationale presented for that choice. The unit was developed and evaluated informally by a content specialist, learning specialists and media specialists. Finally the unit was formally evaluated and the results found to be favourable.

In conclusion, the instructional unit was found to be a valuable production and hopefully will prove to be a useful addition to the Grade Five Social Studies programme.

Recommendations

The researcher recommends, first of all, that the existence of instructional units like "Signals Across the Waves: Marconi's Reception

of the First Transatlantic Wireless Signals" may be made known to all elementary school teachers and to all others who enjoy the study of this province's history.

It is recommended also, that this unit be used in conjunction with the study of the topic in the next book, i.e., as supplementary material on the topic. The unit can, perhaps, be studied independently, but the researcher is convinced that more learning will result if it is used as recommended.

The researcher further recommends that a series of similar topics on Newfoundland history be produced for this grade level. The early transatlantic flights and the establishment of airbases in the province may be suitable topics. These units could be produced in formats similar to that of the Marconi unit.

Implementation

The researcher hopes that this instructional package may eventually be made accessible to all schools throughout the province, either in slide or filmstrip format. This can be accomplished through the Resources Clearing House at Memorial University and through the Instructional Media Center of the Department of Education.

Consideration may also be given by Parks Canada to having a copy of the slide tape presentation available for viewing at either Cabot Tower or the Signal Hill Interpretation Centre. In this way, classes visiting Signal Hill may have an opportunity to view the presentation on or near the actual site of Marconi's historic achievement. However its existence is made known, the researcher hopes that "Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" may be

used for maximum benefit and with maximum success.

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APPENDIX A

PRETEST

PRETEST

Part A. Fill in the blanks

1. The site at which Marconi carried out his experiments in St. John's was _____.

2. The country from which Marconi received the signals was _____.

3. At St. John's, Newfoundland, Marconi received the first _____ signals from across the Atlantic.

4. The type of company that prevented Marconi from continuing his work in Newfoundland was a _____ company.

5. The year in which Marconi received the signals from across the Atlantic was _____.

Part B. Underline the correct answer.

6. The wireless signals heard by Marconi were sent out from:

   a. the United States
   b. England
   c. France
   d. Italy

7. Marconi's great achievement in Newfoundland was:

   a. the building of Cabot Tower
   b. sending telegrams to England
   c. the reception of the first wireless signals from England
   d. the setting up of a signalling station

8. The date on which Marconi heard the first wireless signals from across the Atlantic was:

   a. July 1, 1900
   b. September 1, 1902
   c. December 12, 1901
   d. January 21, 1950

9. When Marconi heard the first wireless signals from across the Atlantic, his aerial wire was raised by:

   a. a high steel tower
   b. a kite
   c. a long ladder
   d. a balloon

10. The location that Marconi selected in St. John's for the reception of the first wireless signals was:

   a. Signal Hill
   b. Cape Spear
   c. Government House
   d. the old railway station

11. Marconi had to leave Newfoundland because:

   a. he had no more money
   b. the government would not support him
   c. the weather was too cold
   d. the telegraph company did not want him here

12. The kind of signal that Marconi heard was:

   a. the sound of a bell
   b. a human voice
   c. the three dots of the letter "S" in Morse Code
   d. the sound of a buzzer

13. When Marconi left Newfoundland he went to:

   a. Nova Scotia
   b. Quebec
   c. Manitoba
   d. Prince Edward Island

14. The building that Marconi used on Signal Hill to receive the wireless signals was:

    a. Cabot Tower
    b. the old hospital
    c. the Newfoundland Hotel
    d. Government House

15. Marconi came to Newfoundland because:

    a. it was a strange place
    b. he liked cold weather
    c. it was his father's home
    d. it was the closest land to England

Part C. Circle "True" if the answer is true and "False" if the answer is false.

16. The signal Marconi heard was the sound of a buzzer. TRUE FALSE

17. Marconi came to Newfoundland because it was closest to England. TRUE FALSE

18. On the day he received the first wireless signals Marconi used a balloon to raise his aerial. TRUE FALSE

19. Marconi used the old hospital on Signal Hill. TRUE FALSE

20. Marconi was born in England. TRUE FALSE

21. After he left St. John's, Marconi went to Nova Scotia. TRUE FALSE

22. Marconi's assistant, Mr. Kemp, also heard the signals on Signal Hill. TRUE FALSE

23. Marconi planned to build a wireless station at Cape Race. TRUE FALSE

24. Marconi did not speak to the press right away because he hoped to hear the signals again the following day. TRUE FALSE

25. Marconi used a telephone receiver to hear the signals from England. TRUE FALSE

SCORE KEY FOR PRETEST

Part A

1. Signal Hill
2. England
3. Wireless
4. Telegraph
5. 1901

Part B

6. b
7. c
8. c
9. b
10. a
11. d
12. c
13. a
14. b
15. d

Part C

16. False
17. True
18. False
19. True
20. False
21. True
22. True
23. False
24. True
25. True

APPENDIX B

POSTTEST

POSTTEST

Part A. Fill in the blanks.

1. At St. John's, Newfoundland, Marconi received the first _____ signals from across the Atlantic.

2. The site at which Marconi carried out his experiments in St. John's was _____.

3. The year in which Marconi received the signals from across the Atlantic was _____.

4. The country from which Marconi received the signals was _____.

5. The type of company that prevented Marconi from continuing his work in Newfoundland was a _____ company.

Part B. Underline the correct answer.

6. Marconi's great achievement in Newfoundland was:

   a. the building of Cabot Tower
   b. sending telegrams to England
   c. the reception of the first wireless signals from England
   d. the setting up of a signalling station

7. The location that Marconi selected in St. John's for the reception of the first wireless signals was:

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9. The date on which Marconi heard the first wireless signals from across the Atlantic was:

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10. Marconi had to leave Newfoundland because:

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   d. a balloon

12. The kind of signal that Marconi heard was:

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   c. the three dots of the letter "S" in Morse Code
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14. Marconi came to Newfoundland because:

   a. it was a strange place.

b. he liked cold weather

c. it was his father's home

d. it was the closest land to England

15. When Marconi left Newfoundland he went to:

a. Nova Scotia

b. Quebec

c. Manitoba

d. Prince Edward Island

Part C. Circle "True" if the answer is true and "False" if the answer is false.

16. On the day he received the first wireless signals, Marconi used a balloon to raise his aerial. TRUE FALSE

17. The signal Marconi heard was the sound of a buzzer. TRUE FALSE

18. Marconi used the old hospital on Signal Hill. TRUE FALSE

19. Marconi came to Newfoundland because it was closest to England. TRUE FALSE

20. After he left St. John's, Marconi went to Nova Scotia. TRUE FALSE

21. Marconi was born in England. TRUE FALSE

22. Marconi planned to build a wireless station at Cape Race. TRUE FALSE

23. Marconi's assistant, Mr. Kemp, also heard the signals on Signal Hill. TRUE FALSE

24. Marconi used a telephone receiver to hear the signals from England. TRUE FALSE

25. Marconi did not speak to the press right away because he hoped to hear the signals again the following day. TRUE FALSE

SCORE KEY FOR POSTTEST

Part A

1. wireless
2. Signal Hill
3. 1901
4. England
5. telegraph

Part B

6. c
7. a
8. b
9. c
10. d
11. b
12. c
13. b
14. d
15. a

Part C

16. False
17. False
18. True
19. True
20. True
21. False
22. False
23. True
24. True
25. True

APPENDIX C

ATTITUDE SURVEY INSTRUMENT

March 9, 1981

Dear Teacher:

As a graduate student in Learning Resources, Faculty of Education, Memorial University, I am considering the development of supplementary instructional materials for the Social Studies programme at the elementary level.

It has been suggested that supplementary instructional material may be needed for the topic "Marconi and Wireless". More specifically, this would deal with the transmission of the first wireless signals across the Atlantic from Cornwall, England to St. John's in December of 1901. Information would be provided on the occurrences leading up to this event, including the first experiments carried out by Marconi and his assistants. As well, this supplementary material would discuss later experiments in the field of wireless, pioneered by Marconi, which eventually led to the invention of radio.

It would be greatly appreciated if you could assist me in my endeavor by answering the enclosed questionnaires. The first deals essentially with the need for such materials, while the second questionnaire will provide feedback for me on the kind of material that you would like to see produced, i.e., the media used. Your suggestions and comments would be most welcomed. A stamped, self-addressed envelope is provided for your convenience. Since time is a major factor, I would appreciate having the questionnaires returned before March 20, 1981.

Thank you for your cooperation.

Yours truly,

Joseph A. Ryan

QUESTIONNAIRE # 1

1. Is there sufficient information provided on Marconi and the receiving of the wireless signal across the Atlantic in 1901 in the Grade V History text Newfoundland and Labrador: A Brief History (Harris, 1968)?

   Yes No

2. Do you think that there would be some value in studying this topic in greater depth?

   Yes No

3. (a) Are you presently using any resource materials on this topic beyond what is in the text?

   Yes No

   (b) If Yes to 3(a), what are these materials?

   _____

   _____

4. If Yes to 3(a), do you feel that these materials are adequate for this topic?

   Yes No

5. If No to 3(a), do you know of any resource materials that you could use to provide your students with more information on this topic?

   Yes No

6. Would you make use of an instructional package if it were available to you?

   Yes No

Comments:

QUESTIONNAIRE # 2

Instructional packages can be produced in a number of ways. Some of the media which can be used include slides, filmstrips, audio-tapes and student booklets. Some media are more effective in the classroom than others, and some are undoubtedly more practical.

Listed below are several of the media which are practical for me to produce. I would ask that for each medium you give two ratings. The first rating concerns how effective you think a particular medium is. For instance: if you feel a student booklet is a very effective instructional medium, you would indicate this with a 1. On the other hand, if you think audio-tapes are ineffective, you would indicate this with a 3. A rating of 2 would indicate average effectiveness.

The second rating concerns how practical it is for you to use each medium in your school. If, for example, you have no slide projector, you would rate slides as impractical (3).

Media	Effective - Ineffective			Practical - Impractical		
Audio tape only	1	2	3	1	2	3
Slides only	1	2	3	1	2	3
Filmstrip only	1	2	3	1	2	3
Video-tape only	1	2	3	1	2	3
Booklet only	1	2	3	1	2	3
Slides and tape	1	2	3	1	2	3
Slides and script	1	2	3	1	2	3
Filmstrip and tape	1	2	3	1	2	3
Filmstrip and script	1	2	3	1	2	3
Booklet and slides & script	1	2	3	1	2	3
Booklet and filmstrip and script	1	2	3	1	2	3
Other combinations of media?						

Having given thought to the various media and their ratings, please indicate your preference for the three most desirable forms of instructional package, and rank them first, second and third.

#1 _____ #2 _____ #3 _____

APPENDIX D

TEACHER QUESTIONNAIRE

TEACHER QUESTIONNAIRE

Could you please answer the following questions as fully as possible. Further comments and/or suggestions would be most welcome.

1. (a) Are the visuals used in this presentation appropriate?

_____

(b) Are there some that could be changed?

_____

(c) If so, which ones?

_____

2. (a) Are the sound effects (wind, storm, Morse Code signals, etc.) effective? _____

(b) Should more sound effects be added? _____

(c) If so, where? _____

3. (a) Is the music at the beginning and end appropriate? _____

(b) Should more music be added? _____

(c) If so, where? _____

4. (a) Is the narration effective? _____

(b) Are there changes that could be made? _____

(c) If so, where? _____

5. Is the presentation too long for Grade Five students?

_____

6. Is the vocabulary of the presentation too difficult?

_____

7. Is the topic covered in enough detail? _____

8. Is the presentation an effective teaching aid for Grade Five students? _____

9. How would you rate this presentation overall?

poor fair good very good excellent

10. How would you recommend that this presentation be used with Grade five Social Studies instruction? _____

_____

APPENDIX E

SCRIPT

SCRIPT

1. On a cold, bleak day in December, 1901, a young man sat in an old building on Signal Hill, St. John's, Newfoundland. He listened intently to a telephone receiver while his companion waited anxiously nearby. From time to time, he checked his instruments, frowned, but continued to listen.

2. Who was this man and what did he hope to hear? The man's name was Guglielmo Marconi, and he waited to hear the very first radio signals from across the Atlantic Ocean.

3. Twenty-seven years earlier, Guglielmo Marconi had been born in Bologna, Italy. As a young man, he was keenly interested in electricity and in wireless communication.

4. At his father's house, Marconi spent much of his time reading and studying on his own. In the attic, he carried out his first wireless experiments.

5. By September of 1895, Marconi could send wireless signals a distance of over two miles. He used Morse Code signals - usually the letter "S". Before long, he had developed a wireless communication system.

6. When the government of Italy refused to help him financially, Marconi went to England. Since England was a maritime nation, he went to see if officials there might be interested in a system which could link ships at sea with stations on shore.

7. He demonstrated his system for officials in charge of communications. They were confident that Marconi's system could be used for sending messages between ships and lighthouses. They arranged financing for Marconi to continue his experiments.

8. A year or so later in England, Marconi registered his first company, The Wireless Telegraph and Signal Co., Ltd. He later changed the name to Marconi's Wireless Telegraph Co., Ltd.

9. In 1896, Marconi returned to Italy and performed wireless experiments for the Italian Navy. There, he recorded the world's first ship-to-shore radio messages with the ship "San Martino". The Italian Navy soon after adopted his system and became the world's first navy to use wireless.

10. In the fall of 1897, Marconi established the first permanent wireless station on the Isle of Wight in southern England. Through all types of weather conditions, he was able to communicate with ships at sea within an eighteen mile range.

11. As more wireless stations were built and began to send messages, interference became a problem. Marconi solved this by developing the radio tuner. Now, several stations could send and receive wireless messages at the same time, without interfering with other signals.

12. On March 27, 1899, Marconi linked England and France by wireless. This was a great event, and Marconi received hundreds of letters of congratulations. He was now ready for the completion of his big dream - sending wireless signals across the Atlantic Ocean.

13. To prepare for this, Marconi had a powerful wireless station built at Poldhu, on the south-west coast of England. This station had a ring of aerial masts two hundred feet high. The Poldhu station was designed to send and receive wireless messages.

14. In North America, a similar station was built at Cape Cod, Massachusetts. Marconi felt confident that this station would pick up signals from across the Atlantic.

15. Then disaster struck. On September 15, 1901, a storm damaged the station at Poldhu extensively. The great aerial lay in a tangled heap on the ground.

16. Marconi remained calm. Within a week, the wreckage was cleared and a simple aerial built. Then a second disaster struck. On November 26, the aerial at the Cape Cod station was blown down.

17. Marconi decided to forget for a time the idea of two-way communications across the Atlantic. He would send instead a one-way message from England to Newfoundland. He chose Newfoundland because it was the closest part of North America to Europe.

18. Marconi was already familiar with Newfoundland. The Minister of Marine and Fisheries, Mr. T.J. Murphy, had sent him a chart showing shipwrecks on the coast, and asked him about the possibility of establishing a wireless station there.

19. Marconi and two assistants, Kemp and Paget, arrived in St. John's on December 6, 1901. He told local reporters that his aim was to communicate with ships four hundred miles out to sea. Nothing was said about the real purpose of his visit.

20. Marconi selected Signal Hill, high above the town, as a site for his receiving station. Signal Hill had long been used for sending visual signals to ships at sea.

21. On top of Signal Hill, close to Cabot Tower, was an old military barracks, which was then used as a hospital. Marconi set up his apparatus in a room on the ground floor of this building.

22. Outside the old hospital was a small level area. This would be suitable for raising the aerial by means of the balloons or kites which Marconi had decided to use.

23. Work began at once, and by Tuesday, December 10, Marconi was ready.

24. He cabled his station at Poldhu to begin sending the signals every afternoon, beginning on Wednesday, December 11. The signal chosen was the three dots of the Morse letter "S".

25. The next day was a windy one. Kemp had trouble controlling the balloon carrying the aerial. Inside the old building, Marconi could hear nothing but static in his receiver. Shortly before three o'clock, he thought he could detect a few very weak signals amid the static.

26. On Thursday, December 12, 1901, Marconi decided to raise the aerial with a kite. The first one broke away and was lost.

27. A second kite was launched with difficulty. At last the crucial moment had arrived, for which Marconi had long prepared.

28. In the small, dark room of the old hospital, Marconi and his assistant listened intently. Because of the high winds swaying the kite, no automatic recording device could be used. Instead, Marconi used an ordinary telephone receiver to pick up the Morse signal.

29. As noon approached, Marconi listened and listened. Not a sound was heard for half an hour. He checked his instruments again and again. Had something gone wrong in England? Was his slender copper aerial strong enough to pick up the signals?

30. Without warning, there was a sharp click in the earphone. Then, at about half past twelve, three faint little clicks were heard. These corresponded to the three dots of the Morse letter "S".

31. Marconi could not be satisfied unless the signals were heard by someone else. He handed the receiver to his assistant. "Can you hear anything, Mr. Kemp?" he asked. Kemp listened and heard the three sharp clicks repeated several times.

32. They continued to listen to be sure there was no mistake. What they were hearing had to be the signals from Poldhu. Marconi was now sure that the wireless waves sent out from England had crossed the Atlantic.

33. After a time, the signals faded. But the test had been successful. On that day, December 12, 1901, Marconi recorded a brief note in his diary: "Sigs. (signals) at 12:30, 1:10 and 2:20."

34. When Marconi returned to his hotel that evening he said nothing to the Press about his wonderful achievement. He was hoping for

stronger signals on Friday. Signals were heard the next day, but they were fainter.

35. On Saturday, December 14, a further attempt was made to hear the signals. Unfortunately, this was not successful. Trouble with the kite forced Marconi to give up. The experiment, however, had succeeded. A new era of world-wide communications had begun.

36. That afternoon, Marconi cabled his company that the signals had been received. Later that night, he announced the news to the Press. Soon news of his achievement was telegraphed to all parts of the world.

37. Congratulations and praise poured in for Marconi. In St. John's, The Evening Telegram carried the following headline: "Marconi's success creates great excitement all over the world."

38. At Government House, the Governor of Newfoundland gave a dinner for Marconi. Long speeches of praise were made in his honour.

39. Excited by his success, Marconi made plans to build a permanent wireless station in Newfoundland. Cape Spear, within easy reach of St. John's was inspected as a possible site.

40. One company was not happy over Marconi's success. The Anglo-American Telegraph Company had total control of the communication service in Newfoundland. It stated that Marconi's experiments were interfering with its work. It threatened him with legal action and forced him to stop his experiments.

41. The Government of Newfoundland, however, officially supported Marconi. In fact, the Governor, the Premier, the Cabinet Members and other

officials all went to Signal Hill to witness a wireless demonstration.

42. The problems with the Anglo-American Company did not end. Marconi was forced to leave Newfoundland and go to Nova Scotia.

43. At Glace Bay, he built a powerful wireless station. From there, he eventually established a commercial transatlantic wireless service.

44. Marconi had done it! In December, 1901, messages without wires had crossed the great Atlantic Ocean. The development of radio and television would soon follow. A completely new age in the field of communications had begun.

APPENDIX F

TEACHER'S GUIDE

Teacher's Guide

for the Sound-Slide Programme

"Signals Across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals"

Division of Learning Resources

Faculty of Education

Memorial University of Newfoundland

1983

TABLE OF CONTENTS

PURPOSE AND GENERAL INFORMATION

The instructional package "Signals across the Waves: Marconi's Reception of the First Transatlantic Wireless Signals" was developed to provide students in the Grade Five Social Studies Programme with information on a siginficant event in the history of Newfoundland.

The prescribed history text, Newfoundland and Labrador: a Brief History provides very little information on this topic. With a greater interest developing in Newfoundland history, it is hoped that this instructional package will give students some insight into Marconi and permit them to see that Newfoundland once played a key role in the dawning of a new era in telecommunications.

BACKGROUND INFORMATION

Guglielmo Marconi was born on April 25, 1874 in Bologna, Italy, the second son of Guiseppe and Annie Marconi. As a young boy he developed a keen interest in electricity, the focal point of his interest being the problem of sending electronic messages from one position to another without the use of connecting wires.

Young Marconi disliked formal lessons and had little regular schooling, but he did spend a great deal of time reading in his father's excellent library. By the winter of 1894-95 he had begun to carry out electrical experiments in the attic of his father's house, the first being the ringing of a bell thirty feet away by electrical impulse without any connecting wires. Before long, he had moved outdoors where he transmitted and received signals (usually the letter "S" in Morse Code) across distances of approximately two miles. This was a great improvement over the one hundred yards or so recorded by other experimenters in this field and it gave Marconi confidence to seek financial backing for his experiments. He applied first to the Ministry of Posts and Telegraphs in the Italian government to see if it would be interested in witnessing a demonstration of the signalling apparatus, but the official reply was a negative one, forcing Marconi to look elsewhere for support.

Since England was then the greatest maritime country in the world and since Marconi saw that his new system of communication could be used to link ships at sea with shore bases, he decided to take his invention there. He was introduced to William Preece, Engineer-in-Chief of the General Post Office and after several private and public demonstrations, Preece was satisfied that the system had potential for

communicating with ships and lighthouses.

Before further experiments could be arranged, Marconi was called up for military service in his native Italy. If he were to remain in England, he would have to renounce his Italian citizenship. Rather than do this, he was enrolled as a cadet in the Italian Navy and was posted as an assistant naval attaché to the Italian Embassy in London. This was a nominal post leaving him free to continue his experimental work.

On July 20, 1897, in England, with capital of one hundred thousand pounds, advanced by business associates and friends, Marconi registered his first private company, the Wireless Telegraph and Signal Co. Ltd., a name later changed to Marconi's Wireless Telegraph Co. Ltd.

Summoned back to Italy by the Italian Government, Marconi demonstrated his experiments for the Italian Navy, recording the first ship-to-shore wireless communication with the cruise ship "San Martino". This was accomplished at distances up to twelve miles, using 115 feet high aerials attached to the tall masts of the ship. Upon the completion of these experiments, the Italian Navy decided to adopt Marconi's system, thus becoming the world's first navy to use radio.

Upon his return to England in the fall of 1897, Marconi established the first permanent wireless station at the Needles Hotel, Isle of Wight. Good radio contact was made between this shore station and two small steamers off the coast. A signalling range of eighteen miles was achieved, but more important than that, the electromagnetic waves had been received despite some really bad weather at sea. Furthermore, the electric waves had not been influenced by the curvature of the earth, at least over a short distance. Lord Kelvin, an eminent scientist of that

station was set up on Cape Cod, Massachusetts, where the North American continent extended out into the ocean. Earlier tests conducted from Poldhu had resulted in signals being received 225 miles away on the coast of Ireland, unaffected by the curvature of the earth. Marconi was confident that similar results would be obtained over the much greater distance across the Atlantic. Before tests could be carried out both stations were extensively damaged by storms. Marconi was forced to erect a simpler transmitting station at Poldhu and settle for one-way communication from Poldhu to Newfoundland, the closest part of the North American continent to Europe.

Marconi, with two assistants, Kemp and Paget, arrived in St. John's on December 6, 1901. After calling on the Governor, Sir Cavendish Boyle, and the Premier, Sir Robert Bond, he selected a site for his receiving station. Signal Hill, rising high above the town, was chosen, and the receiving apparatus was set up in an old military hospital on the summit. The idea of using tall aerial masts had been abandoned in favor of an aerial wire trailed from either a kite or a balloon. The press and the citizens of St. John's had been informed that Marconi was attempting to establish contact with ocean-going liners. Ships bound for America fitted with wireless had been asked to report their positions to him.

The transmitting station at Poldhu had been cabled to begin sending the pre-arranged signal every afternoon for a fixed three hour period, the signal chosen being the three dots of the Morse letter "S". This letter was chosen, partly because the use of a simple letter made it possible to send automatically, but also because the keying system at Poldhu was inadequate and the transmission of dashes would have imposed a greater strain on the apparatus, if carried out continuously. The three dots

would also be more easily identifiable through heavy static. Marconi had decided to use a telephone receiver and a self-restoring coherer - a crude signal detector, but because the aerial was held aloft by a kite, a tuned receiver and an automatic recorder could not be used.

The weather was inclement and several attempts were made to try to raise balloons, but these were not successful, the balloons being torn lose from their wires. Extreme difficulty was experienced in elevating kites, and the constant tugging and diving of the kite kept changing the height of the aerial wire and hence its receiving properties. Yet, shortly after 12:30 p.m. local time on December 12, 1901, Marconi managed to detect the three sharp little clicks corresponding to the three dots being sent out from England. Kemp was asked to confirm that the faint but unmistakable signals could indeed be heard and Marconi's notebook for that date records, "Sigs. at 12:30, 1:10 and 2:20." The electric waves being sent out from Poldhu had crossed the Atlantic ignoring the curvature of the earth. Marconi realized then that soon full messages without wires or cables would be able to be sent and received across the Atlantic. A great success had been achieved. The dawning of a vast new era of world-wide communications had begun.

Public reaction was, of course, enthusiastic, but in the scientific community many considered that Marconi's ears had deceived him, though few doubted his honesty. The Anglo-American Telegraph operating a cable system in Newfoundland at once asserted its monopoly by threatening legal action if the tests continued, thereby denying Marconi any chance of confirming his observation. Two months later, however, he rigged an outside aerial on a west bound transatlantic liner and was able to maintain night-time reception of messages from Poldhu to a range of 2,500

kilometers under conditions that left no room for doubt. These signals were witnessed by either the ship's captain or first officer and were automatically recorded on Morse tape. There was no longer any question about the ability of wireless telegraphy to transmit messages across the Atlantic.

Since he could no longer continue his experiments in Newfoundland without running into difficulties with the cable company, Marconi accepted the offer from the Canadian Government of land at Glace Bay, Nova Scotia. Work began there to build a really powerful permanent wireless station with the intention of inaugurating a transatlantic wireless service. After much trial and error, messages were finally sent between Poldhu and Glace Bay late in 1902. It was not, however, until 1970, when a new, powerful station was constructed at Cliften, Ireland, that Marconi's dream of a commercial transatlantic wireless service was fully realized.

Meanwhile, Lloyds of London had abandoned its own wireless experimentation in favor of contracting Marconi's company for fourteen years to use their equipment. The United States Navy had also become interested in using his system, indicating the prestige he had gained through his great experiment. Wireless experiments continued to be carried out over varying distances with ships at sea and in 1909, when the White Star liner "Republic" was in collision with another vessel off the Atlantic Coast, the dramatic search and rescue mission was controlled by wireless and over 1700 lives were saved.

Marconi concentrated his efforts during the ensuing years in new uses for the wireless system with a major consideration being the wireless transmission of the human voice, called wireless telephony or radio telephony. By 1920 this had been achieved, and ships crossing the Atlantic

could remain in voice contact with land stations throughout the entire crossing.

In the closing years of his life, Marconi and his assistants worked at perfecting past inventions and devoted much time and effort to the development of the short-wave radio. Preliminary work was also carried out on radar and wireless direction finding equipment. It was while working on radar development in September, 1934, that Marconi suffered a severe heart attack. Other heart attacks followed during the next three years until July 20, 1937, when Guglielmo Marconi, then aged 63, died peacefully in Rome.

SOURCES

Baker, W.J. A History of the Marconi Company. London: Methuen, 1970.

This history of the Marconi Company includes a very thorough account of the reception of the first transatlantic wireless signals.

Candow, J.E. A Structural and Narrative History of Signal Hill National Historic Park and Area to 1945. Manuscript Report Number 348, 1978. (Available from Parks Canada).

This manuscript contains a very good account of Marconi's achievement in St. John's. Details are given of the preparations for and the carrying out of the first transatlantic wireless experiment.

Gunston, D. Marconi: Father of Radio. New York: Crowell-Collier Press, 1965.

This is an excellent book on Marconi and the development of wireless communication. Details are provided on the first transatlantic wireless experiment.

Jolly, W.P. Marconi. New York: Stein and Day, 1972.

This biography of Marconi covers in depth all aspects of his life including his reception of the first transatlantic wireless signals.

Marconi, D. My Father, Marconi. New York: McGraw-Hill, 1962.

This is a well written account of Marconi's scientific achievements as well as an intimate portrait of his personal life.

GLOSSARY

The following words may present some difficulty for Grade Five students. Should the teacher wish, these words could be written on the chalk board and a short definition provided before students view the slide-sound programme.

1.	adopted	taken over
2.	aerial	antenna for picking up signals
3.	apparatus	instruments for a particular purpose
4.	automatic	acting on its own
5.	commercial	relating to commerce or money
6.	corresponded	agreed with
7.	demonstrated	showed how something worked
8.	established	set up or built
9.	extensively	greatly or very much
10.	financially	relating to money
11.	intently	in an intent or serious manner
12.	interference	confusion of radio signals
13.	Isle of Wight	a small island off the south coast of England
14.	maritime	near the sea
15.	monopoly	total control over
16.	Morse Code	a code in which letters of the alphabet are represented by dots and dashes or long and short sounds. Used for sending messages.
17.	Poldhu	a small village on the south west coast of England

18.	registered	recorded as the owner.
19.	transatlantic	across the Atlantic Ocean.
20.	wireless	without any connecting wires.

DISCUSSION TOPICS

1. What circumstances forced Marconi to choose Newfoundland for his famous experiment?

2. Why did Marconi not tell the Press the true nature of his work in St. John's?

3. Why did Marconi not try to fight the Anglo-American Telegraph Company?

4. What benefits might Newfoundland have gained if Marconi had not left for Nova Scotia?

ACTIVITIES

1. Arrange a class visit to Signal Hill and view the Marconi display in Cabot Tower.

2. Look up the Morse Code system of communications.

3. Research the life of Marconi to discover what other scientific work he was involved in.

LEARNING OBJECTIVES

The instructional package has been so designed that after viewing the slides and listening to the tape, students should be able to meet the following objectives. These objectives have been sub-divided into three categories of information: knowledge that is deemed essential; knowledge that is considered important; and knowledge that is desirable for the student to know.

Category ONE - Essential Objectives

After viewing the slide-tape presentation, the learner should be able to identify correctly:

1. the kind of experiment carried out by Marconi at St. John's, Newfoundland
2. the site at St. John's which Marconi selected for his experiments.
3. the name of the country where the first signals came from
4. the year in which the first transatlantic signals were received
5. the reason Marconi could not continue his work in Newfoundland

Category TWO - Important Objectives

After viewing the slide-tape presentation, the learner should also be able to identify correctly:

6. the method Marconi used to raise his aerial wires when the signals were received
7. the type of signal that Marconi hoped to receive from across the Atlantic
8. the building on Signal Hill in which Marconi received the first wireless signals

9. one reason why Marconi selected Newfoundland for his experiment
10. the province to which Marconi went after he left Newfoundland

Category THREE - Desirable Objectives

After viewing the slide-tape presentation, the learner may be able to identify correctly:

11. the name of the country where Marconi was born
12. the location in Newfoundland near St. John's where Marconi hoped to build a permanent wireless station
13. the name of Marconi's assistant who also heard the first trans-atlantic wireless signals
14. the instrument used by Marconi to hear the signals from England
15. the reason why Marconi did not announce his news to the Press immediately.

POSTTEST

Part A. Fill in the blanks

1. At St. John's, Newfoundland, Marconi received the first _____ signals from across the Atlantic.

2. The site at which Marconi carried out his experiments in St. John's was _____.

3. The year in which Marconi received the signals from across the Atlantic was _____.

4. The country from which Marconi received the signals was _____.

5. The type of company that prevented Marconi from continuing his work in Newfoundland was a _____ company.

Part B. Underline the correct answer

6. Marconi's great achievement in Newfoundland was:

   a. the building of Cabot Tower
   b. sending telegrams to England
   c. the reception of the first wireless signals from England
   d. the setting up of a signalling station

7. The location that Marconi selected in St. John's for the reception of the first wireless signals was:

   a. Signal Hill
   b. Cape Spear
   c. Government House
   d. The old railway station

8. The wireless signals heard by Marconi were sent out from:

   a. the United States
   b. England
   c. France
   d. Italy

9. The date on which Marconi heard the first wireless signals from across the Atlantic was:

   a. July 1, 1900
   b. September 1, 1902
   c. December 12, 1901
   d. January 21, 1950

10. Marconi had to leave Newfoundland because:

   a. he had no more money
   b. the government would not support him
   c. the weather was too cold
   d. the telegraph company did not want him here

11. When Marconi heard the first wireless signals from across the Atlantic, his aerial wire was raised by:

   a. a high steel tower
   b. a kite
   c. a long ladder
   d. a balloon

12. The kind of signal that Marconi heard was:

   a. the sound of a bell
   b. a human voice
   c. the three dots of the letter "S" in Morse Code
   d. the sound of a buzzer

13. The building that Marconi used on Signal Hill to receive the wireless signals was:

   a. Cabot Tower
   b. the old hospital
   c. the Newfoundland Hotel
   d. Government House

14. Marconi came to Newfoundland because:

   a. it was a strange place

b. he liked cold weather

c. it was his father's home

d. it was the closest land to England

15. When Marconi left Newfoundland he went to:

a. Nova Scotia

b. Quebec

c. Manitoba

d. Prince Edward Island

Part C. Circle "True" if the answer is true and "False" if the answer is false.

16. On the day he received the first wireless signals, Marconi used a balloon to raise his aerial. TRUE FALSE

17. The signal Marconi heard was the sound of a buzzer. TRUE FALSE

18. Marconi used the old hospital on Signal Hill. TRUE FALSE

19. Marconi came to Newfoundland because it was closest to England. TRUE FALSE

20. After he left St. John's, Marconi went to Nova Scotia. TRUE FALSE

21. Marconi was born in England. TRUE FALSE

22. Marconi planned to build a wireless station at Cape Race. TRUE FALSE

23. Marconi's assistant, Mr. Kemp, also heard the signals on Signal Hill. TRUE FALSE

24. Marconi used a telephone receiver to hear the signals from England. TRUE FALSE

25. Marconi did not speak to the press right away because he hoped to hear the signals again the following day. TRUE FALSE

SCRIPT

1. On a cold, bleak day in December, 1901, a young man sat in an old building on Signal Hill, St. John's, Newfoundland. He listened intently to a telephone receiver while his companion waited anxiously nearby. From time to time, he checked his instruments, frowned, but continued to listen.

2. Who was this man and what did he hope to hear? The man's name was Guglielmo Marconi, and he waited to hear the very first radio signals from across the Atlantic Ocean.

3. Twenty-seven years earlier, Guglielmo Marconi had been born in Bologna, Italy. As a young man, he was keenly interested in electricity and in wireless communication.

4. At his father's house, Marconi spent much of his time reading and studying on his own. In the attic, he carried out his first wireless experiments.

5. By September of 1895, Marconi could send wireless signals a distance of over two miles. He used Morse Code signals - usually the letter "S". Before long, he had developed a wireless communication system.

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They were confident that Marconi's system could be used for sending messages between ships and lighthouses. They arranged financing for Marconi to continue his experiments.

8. A year or so later in England, Marconi registered his first company, The Wireless Telegraph and Signal Co., Ltd. He later changed the name to Marconi's Wireless Telegraph Co., Ltd.

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11. As more wireless stations were built and began to send messages, interference became a problem. Marconi solved this by developing the radio tuner. Now, several stations could send and receive wireless messages at the same time, without interfering with other signals.

12. On March 27, 1899, Marconi linked England and France by wireless. This was a great event, and Marconi received hundreds of letters of congratulations. He was now ready for the completion of his big dream - sending wireless signals across the Atlantic Ocean.

13. To prepare for this, Marconi had a powerful wireless station built at Poldhu, on the south-west coast of England. This Station had a

ring of aerial masts two hundred feet high. The Poldhu station was designed to send and receive wireless messages.

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26. On Thursday, December 12, 1901, Marconi decided to raise the aerial with a kite. The first one broke away and was lost.

27. A second kite was launched with difficulty. At last the crucial moment had arrived, for which Marconi had long prepared.

28. In the small, dark room of the old hospital, Marconi and his

assistant listened intently. Because of the high winds swaying the kite, no automatic recording device could be used. Instead, Marconi used an ordinary telephone receiver to pick up the Morse signal.

29. As noon approached, Marconi listened and listened. Not a sound was heard for half an hour. He checked his instruments again and again. Had something gone wrong in England? Was his slender copper aerial strong enough to pick up the signals?

30. Without warning, there was a sharp click in the earphone. Then, at about half past twelve, three faint little clicks were heard. These corresponded to the three dots of the Morse letter "S".

31. Marconi could not be satisfied unless the signals were heard by someone else. He handed the receiver to his assistant. "Can you hear anything, Mr. Kemp?" he asked. Kemp listened and heard the three sharp clicks repeated several times.

32. They continued to listen to be sure there was no mistake. What they were hearing had to be the signals from Poldhu. Marconi was now sure that the wireless waves sent out from England had crossed the Atlantic.

33. After a time, the signals faded. But the test had been successful. On that day, December 12, 1901, Marconi recorded a brief note in his diary: "Sigs. (signals) at 12:30, 1:10 and 2:20."

34. When Marconi returned to his hotel that evening he said nothing to the Press about his wonderful achievement. He was hoping for stronger signals on Friday. Signals were heard the next day, but they were fainter.

35. On Saturday, December 14, a further attempt was made to hear the signals. Unfortunately, this was not successful. Trouble with the kite forced Marconi to give up. The experiment, however, had succeeded. A new era of world-wide communications had begun.

36. That afternoon, Marconi cabled his company that the signals had been received. Later that night, he announced the news to the Press. Soon news of his achievement was telegraphed to all parts of the world.

37. Congratulations and praise poured in for Marconi. In St. John's, The Evening Telegram carried the following headline: "Marconi's success creates great excitement all over the world."

38. At Government House, the Governor of Newfoundland gave a dinner for Marconi. Long speeches of praise were made in his honour.

39. Excited by his success, Marconi made plans to build a permanent wireless station in Newfoundland. Cape Spear, within easy reach of St. John's was inspected as a possible site.

40. One company was not happy over Marconi's success. The Anglo-American Telegraph Company had total control of the communication service in Newfoundland. It stated that Marconi's experiments were interfering with its work. It threatened him with legal action and forced him to stop his experiments.

41. The Government of Newfoundland, however, officially supported Marconi. In fact, the Governor, the Premier, the Cabinet Members and other officials all went to Signal Hill to witness a wireless demonstration.

42. The problems with the Anglo-American Company did not end. Marconi was forced to leave Newfoundland and go to Nova Scotia.

43. At Glace Bay, he built a powerful wireless station. From there, he eventually established a commercial transatlantic wireless service.

44. Marconi had done it! In December, 1901, messages without wires had crossed the great Atlantic Ocean. The development of radio and television would soon follow. A completely new age in the field of communications had begun.

APPENDIX G

SOUND - SLIDE PROGRAMME

SIGNALS ACROSS THE WAVES: MARCONI'S RECEPTION
OF THE FIRST TRANSATLANTIC WIRELESS SIGNALS

- UNDER SEPARATE COVER

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