Evaluating the Professional Development Materials Provided by the Australian Bureau of Statistics for the CensusAtSchool Program

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Abstract

The National Education Services Unit of the Australian Bureau of Statistics (ABS) has published professional development materials for their flagship project, the CensusAtSchool program. The goal of this project was to analyze the effectiveness of these professional development materials in order to make them more convenient and accessible for teachers while increasing the amount of statistics taught in the classroom. The team utilized several techniques to fulfill the overall goal, including operational evaluations, electronic surveys, and phone interviews. Although availability of teaches and holiday time created roadblocks for the project team, the aforementioned methods provided sufficient data to make suggestions to the ABS. These suggestions include creating multiple versions of the tutorials to cater to teachers of different skill levels, knowledge, and needs; altering the delivery methods to make them more accessible; advertising the program in order to reach more teachers; and adding a website tutorial which will hopefully encourage teachers to explore the amount of free material that the NESU has available online. The project team hopes that these suggestions can be implemented into new tutorials such that teachers can ultimately teach their students with more confidence in using statistics.

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Executive Summary

Understanding statistics is an essential skill many people use on a daily basis when making important choices and decisions. Although statistics is extremely important, people do not always have an adequate grasp of it. In response, the amount of statistics covered in schools' mathematics curricula worldwide has increased since the 1990's. However, many teachers are not comfortable teaching this material due to lack of appropriate statistical background. To address this problem, the National Education Services Unit (NESU) of the Australian Bureau of Statistics has published professional development resources for their flagship project, the CensusAtSchool program. CensusAtSchool aims to raise statistical literacy and increase awareness of the Australian population census. The professional development materials for CAS were released in 2006 in the form of online tutorials, a CD-ROM, a DVD, and more recently, online tutorials. These are now in need of evaluation.

The goal of our study was to determine the efficacy of the DVD and web-based professional development materials available to primary and secondary teachers in Australia through the CensusAtSchool Program. To achieve this goal, the following four objectives were addressed:

1. Assessing the DVD and web-based professional development resources that the ABS currently supplies to increase teachers' knowledge of and ability of teach statistics in the classroom
2. Determining the impacts of these resources on the teachers' confidence to teach statistics
3. Proposing suggestions which are necessary to improve the efficacy of the professional development tutorials
4. Exploring and suggesting other methods of delivery for the professional development resources

In order to satisfy the objectives of this project, the project team developed the following research questions:

1. Do the DVD and web-based professional development resources that the ABS currently supplies increase teachers' knowledge of and ability to teach statistics in their classrooms?
2. Do these resources increase or decrease teachers' confidence in teaching statistics?
3. What aspects and sections of the tutorials need improvement, and how can they be improved?
4. What are other potential methods of delivery for the professional development resources?

To answer these questions, the team designed an operational evaluation to be completed by teachers and school administrators. During the operational evaluation sessions, the participants watched the video tutorials and completed three surveys. The first was the background survey which was created to gather preliminary information such as educational background and current levels of statistical confidence of the participants. While watching the video tutorials, the educators completed a video worksheet, and noted their initial reactions to the materials presented in the tutorials. The last item completed was a concluding survey which was designed to elicit final opinions of the tutorials as well as suggestions and comments. In addition, an observational assessment of the participants was carried out during this session to obtain more detailed results. This involved using a behavioral checklist to gauge teachers' initial responses to the material, as many of the most important reactions from teachers were those that could only be observed. Four operational evaluations were conducted at primary and secondary schools in Victoria.

Due to the small number of evaluations from Victorian schools, a short telephone interview was created to gather data from schools in Northern Territory regarding general professional development. The team hoped that because of its reduced length, busy teachers

would be more motivated to participate in the interview. Of the 180 schools contacted in Northern Territory, 49 (27 percent) participated in the phone interviews.

Concurrently, an electronic survey (e-survey), which was a shortened version of the operational evaluation, was sent to teachers throughout Australia. This version was emailed to primary schools, secondary schools, and some universities in Victoria. It was sent to the personal contacts of ABS employees Ian Wong and Pat Beeson, the Australian Association of Mathematics Teachers (AAMT) and the Geography Teachers Association of Victoria (GTAV), respectively. Primary and secondary school administrators who were interested in the CensusAtSchool project, but could not afford any time for an operational evaluation, were also sent the e-survey to complete. Finally, the e-survey was sent to contacts at both Deakin University and the University of Melbourne for distribution to pre-service teachers. Those interested in helping were asked to respond, but unfortunately, only four of the above stated surveys were returned. This may be attributed to teachers' busy schedules, the Victorian schools' vacations, and the relatively short timeframe of the Interactive Qualifying Project.

The team ran into many barriers that made data collection very difficult. The two week Victorian schools' vacations in April prevented us from conducting operational evaluations and limited our phone interviews during this time. Moreover, the lack of teacher availability limited the results.

Despite these setbacks, the team was able to make tentative conclusions about delivery methods that teachers prefer. The data indicated that teachers hear about professional development mostly from e-mails and other co-workers. Also, a predominant number of the teachers preferred face to face workshops with engaging and interactive presentations. Finally, there was a lack of PD information coming from the school administrators themselves because it is likely that they are too busy to sift through material and subsequently forward it to teachers.

The NESU suggested that the project team evaluate professional development in remote schools versus non-remote schools in Northern Territory. School administrators were asked questions regarding how they find out about professional development, what types of delivery methods they prefer, how much professional development they conduct per year and what they look for in good professional development resources. Overall, there was no difference in the preferences of teachers at remote and non-remote schools. They both mainly found about professional development through the internet and E-mail. They both preferred face to face development sessions, regardless of their location. In addition, the distribution of professional development hours completed each year is generally constant with respect to remote and urban schools. Finally, the number of administrators who had heard of CensuAtSchool was split evenly between remote and urban schools.

Throughout the course of data collection, the team became aware of a distinct separation between the views of primary and secondary teachers. Many primary teachers found that the tutorials were helpful in teaching basic techniques using Microsoft Excel, but most secondary teachers found that materials to be slow and often repetitive. Overall, it seemed that secondary teachers generally have a higher level or confidence in using Microsoft Excel and a higher comfort level in teaching statistics to their students, although our research may be biased because all of the secondary teachers we surveyed were mathematics teachers.

Finally, the team inquired about teachers' intentions, or lack thereof, to use CensusAtSchool in their classrooms. The teachers' responses indicated that after being introduced to the materials, they had gained an interest in using the program, and would therefore utilize CensusAtSchool.

In order to successfully update the CensusAtSchool professional development, the project team suggests that the ABS create multiple versions of the tutorials to cater to teachers of different skill levels, knowledge, and needs. We also suggest altering the delivery methods to make them more accessible to teachers throughout Australia. In particular, video conferencing

over the internet can be used to reach teachers in schools that are too remote to attend a professional development session at a venue. More effectively advertising the CensusAtSchool project is an important addition which will allow the ABS to target more teachers whose administrators may not have had the time to read through the CAS materials and distribute them. Finally, adding an ABS website tutorial will hopefully encourage teachers to explore the large amount of free material that the NESU has available online for their use.

While completing this project, the team acquired valuable knowledge about data collection, teamwork, and most importantly, perseverance. We hope that the data gathered over the course of this term will be beneficial to the Australian Bureau of Statistics and future WPI students. The resulting suggestions will hopefully be used to update the current CensusAtSchool professional development materials, therefore having a positive impact on educational programs throughout Australia.

1.0 Introduction

Statistics is a significant application of mathematics, and is defined as the collection and analysis of numerical data [Oxford English Dictionary 2005]. In the world today, using and understanding statistics is essential. From making important medical decisions and managing personal finance to understanding the news and following political elections, statistics is ubiquitous in daily life. Effective use of statistics, however, is not always as multifaceted; it involves being able to read and record data, analyze charts and information, and interpret results. Norman Giesbrecht stated that "Statistical literacy is an essential skill in our modern society" [Giesbrecht 1996]. Regardless of one's profession, most scholarly and professional activity requires the use of statistics as one of its main tools. H.G. Wells predicted that, "Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write" [ABS 2009].

However, even though statistics is an important part of everyday life and problem solving, people worldwide are not acquiring sufficient statistical knowledge. This stems from the larger issue that preliminary statistics is not being thoroughly taught in schools. Dennis Trewin, a former Australian statistician, implies that teachers are often uncomfortable with their own knowledge of statistics and are therefore less likely to teach the subject. He also discusses the importance of students becoming engaged in statistics earlier in their primary and secondary institutions in order to improve their interest and understanding [Trewin 2009]. In fact, statistics is an important yet simple subject that needs to be taught to younger students. In the uppermost levels of education, the mathematics curricula begin to focus less on statistics and more on analysis, leaving students without enough statistical knowledge.

To combat the paucity of statistical literacy, organizations in several countries have utilized the CensusAtSchool program. CensusAtSchool (CAS) is an online learning experience with an aim to improve mathematical literacy for both teachers and their students [ABS 2009]. This project is being utilized by the Australian Bureau of Statistics (ABS), Australia's official statistical agency that is responsible for the collection and dissemination of statistics

to the government and the community. The National Education Services Unit (NESU) of the ABS has piloted CAS to improve interest in statistics in the Australian education sector. The NESU has conducted professional development (PD) workshops and seminars to inform teachers about CAS. In addition to these workshops, NESU created a free PD DVD containing tutorials pertaining to the use of CensusAtSchool in the classroom that was used in tandem with their workshops. In 2008, however, due to financial and geographic constraints, workshops and seminars were no longer a feasible option for professional development [ABS 2009]. The DVD tutorials were then posted online in 2008 using YouTube and TeacherTube. The goal of this project was to determine the efficacy of the online tutorials and DVD based professional development resources, in particular for facilitating teachers to apply CensusAtSchool in the classroom, as well as improving their own computer and statistical skills.

2.0 Background

According to the Royal Statistical Society (RSS), teachers have an inadequate amount of formal statistical training and most mathematics courses do not cover statistical concepts [Broers 2006]. Heaton and Mickelson [2002] state that the focus of statistical education should be on teachers' learning of the material; if teachers do not understand, then the students will not either. The CensusAtSchool Program was developed in the United Kingdom in 2001 to aid in statistical training across the world. With Australia's involvement commencing in 2006, it joined countries such as Canada, New Zealand, South Africa, and the United Kingdom in utilizing this program [ABS 2009]. The Australian Bureau of Statistics, in connection with CensusAtSchool, has created a professional development resource to aid teachers in increasing their statistical literacy. However, no official evaluation of the CensusAtSchool professional development resources has yet taken place. The ABS wants to ensure that the delivery methods and content of these professional development materials are as effective and efficient as possible. In addition, they are concerned whether the content is sufficient to increase the teachers' statistical literacy.

2.1 Australian Bureau of Statistics

The Australian Bureau of Statistics was established in 1974. The Australian Bureau of Statistics Act in 1975 established the ABS as a Statutory Authority headed by the Australian Statistician with the status of Permanent Head, responsible to the Treasurer [ABS 2009]. In the 1960s, the ABS received access to computers, allowing them to collect more data in new and exciting ways. Later, the introduction of sampling methods allowed the ABS to further broaden their horizons. ABS's mission is to "Assist and encourage informed decision making, research and discussion within governments and the community, by leading a high quality, objective, and responsive national statistical service."

The Educational Services Unit of the ABS was established in 2000, and is located in the Melbourne office. Its responsibility is to service the school sector from years 1-12 throughout Australia [ABS 2009]. Developments of the Educational unit include the creation of products for use in the school curriculum and the provision of assistance to individuals

using these products. The objectives of Education Services are to "Promote greater understanding, knowledge and access to ABS statistics by teachers, librarians, and students, to increase statistical literacy in the school sector and the broader community, and to promote statistics as a career choice for students."

2.2 The CensusAtSchool Project

CensusAtSchool is an international data collection and analysis project run by the ABS in Australia, for students in years 5-12 [ABS 2009]. The project appeals to young students because it enables them to collect and analyze data about themselves. It was originally based on a similar program developed in the United Kingdom by the Royal Statistical Society's Centre for Statistical Education. The CensusAtSchool creators believe it is important to spark students' interest in statistics early. The ultimate goal of the project is to "Improve statistical literacy by helping students understand the world around them and assist them in making sensible, informed decisions."

The program is conducted in two phases. The first is the data collection phase, which is completed two times within each period of five years. An online questionnaire is distributed in conjunction with the Australian Census of Population and Housing [ABS 2009], and once in between Census years. During this part of the project, schools register through the ABS, and all of the students who voluntarily choose to participate submit the questionnaire on the CAS website. The students fill out the questionnaire about themselves anonymously, answering questions such as: How tall are you? How many bedrooms are there in your home? How much money did you earn or receive last week? After all the data are collected, the questionnaire is closed and a database is created.

In phase two, teachers can take the data and use it in their classrooms. These data can be accessed through a Random Sampler on the ABS website. The Data Usage phase is accessible to students and teachers at all times, therefore providing teachers with a constant, relevant source of data. Using the data, students and teachers have the flexibility to pose many different types of questions [ABS 2009]. The CensusAtSchool program is designed for teachers to use in many subject areas, not just mathematics. The accessibility

of many different types of data allows for lesson plans to be created by teachers across the curriculum and used by students of all ages. The program is ongoing, and these phases continue to repeat with each cycle of five years.

CensusAtSchool is unique in that Australian children can compare data with other students on an international level. Eleven common international questions on the questionnaire allow students in Canada, New Zealand, South Africa, and the United Kingdom to compare their data. NESU also provides a bimonthly newsletter, informing users of updates to the program and other new educational resources available to them from the ABS [ABS 2009]. In addition, the ABS has published Professional Development resources for teachers looking to improve their spreadsheet skills and their knowledge of the CensusAtSchool program.

2.3 Statistical Literacy in the United States

Insufficient statistical literacy is a problem in many countries, including the United States. Addressing this deficiency on a domestic level led to a better understanding of the subject in Australia. The National Council of Teachers of Mathematics (NCTM) played a large role in developing the statistics curriculum in the United States [Watson 1998]. In 1989, the NCTM published the *Curriculum and Evaluation Standards for School Mathematics.* This document highlights the importance of statistics in the curriculum and "Stresses the use of statistical methods to describe, analyze, evaluate and make decisions, and the creation of experimental and theoretical models of situations involving probabilities" [Watson 1998]. It discusses how to implement statistical knowledge into the curriculum for students in Kindergarten through Grade Eight. Many supporting documents were produced following this one. Despite all of these suggestions for positive changes to the curriculum, teachers may still feel overwhelmed because of their own lack of statistical knowledge.

In actuality, many pre-service teachers are wary of statistics before even beginning to learn about it. They find it difficult or boring, thus making it harder to comprehend. Carissa Vilders, a third grade teacher at Tuftonboro Central School in New Hampshire, said that although she feels comfortable teaching mathematics and statistics in the classroom,

many of her co-workers don't feel the same [personal interview, 2009]. Vilders went on to say that "It is sad that they feel so uncomfortable with teaching statistics. In third grade, students are mainly focusing on mean, mode, and range as well as learning how to read charts; it really isn't anything that difficult." However, her level of comfort with statistical literacy didn't come from her elementary education or her college courses, but from her father. "My dad spent a lot of time and focus on mathematics with me when I was a child. This helped me out greatly throughout all levels of my education." When asked why she felt like others have a hard time teaching mathematics, Vilders stated that math is being taught differently now than when she was in school. "I was only told what the steps were that needed to be taken to solve the problem [but in mathematics today], there is much more focus now on why each step is taken." Consequently, current teachers were not taught math using the same methods which they now must use with their students. Therefore, the problem may lie in the manner which teachers were being taught through their years studying elementary education. In 1993, a survey of forty schools found "a need for in-service training for both understanding of the subject matter and awareness of appropriate teaching methodologies" [Greer & Ritson 1993].

Students in American colleges seeking their teaching degrees do not have a significant mathematics requirement; in fact it is very relaxed compared to their other focuses. According to Stephen Lancaster, "The role of statistics in the primary school curriculum has been increasing, thus increasing the need for primary school teachers to be prepared to successfully teach statistics topics" [Lancaster 2008]. He continues to say that teachers do not have a strong grasp of statistical concepts, and the best way to address this problem is through more pre-service training and professional development programs. Vilders also commented on this topic, saying, "I would have liked to see more math and science when I was in college." Her only requirement for mathematics over her four years as an undergraduate was one class for three hours per week that covered elementary math and how to teach it. "It was very helpful in supplying ways to teach mathematics," Vilders said, "But there was hardly any time spent on basic statistics." If classes don't cover the material then the teachers will not understand it; "Teachers can't teach what they don't understand well" [Chapin 2000].

Carissa Vilders is not the only one who feels this way about mathematic requirements necessary to obtain an elementary education degree. Jamie Blanchard, a current student at Stonehill College in Easton, Massachusetts, studying elementary education and psychology said that she feels many people pursuing elementary education have a weakness in statistics. "There should be more of a focus in mathematics as a whole, almost as much of a focus as in language arts" [Blanchard 2009]. Blanchard continued to say that she doesn't enjoy mathematics and statistics, but that she wishes she was being forced to learn more while in college. Stonehill only has two required mathematics classes for their four year undergraduate degree in elementary education, only one of which talks about statistics. One class called Mathematical Reasoning for Educators discusses elementary math concepts. The other class covers some basic statistics and was intended to help with how to teach it in the classroom, but Blanchard stated, "The class didn't really help at all." Professor Lancaster also reported that most elementary education programs will cover no more than 2-3 weeks of statistical material, if any [Lancaster 2008].

A helpful tool for teaching statistics in the classroom is computers; not only do computers help younger students visualize the material they are analyzing, but they are often more fun to use as well. Blanchard said that the only computer program she learned to use regarding statistics was the Statistical Package for the Social Sciences (SPSS), but unfortunately, very few elementary schools have this program on their computers. "I wish I learned how to use something universal such as Microsoft Excel."

Spending more time in the classroom as an undergraduate may be a solution to the problem of statistical literacy, but it is difficult to change degree requirements at schools all around the world. This is the reason that professional development sources for teachers have become so popular; they are part of a much more economical and feasible solution.

2.4 Statistics Curriculum Standards in Australia

Many teachers in Australia face the same challenges as teachers in the United States regarding statistical literacy. According to Jane M. Watson, a professor of Early Childhood and Primary Education at the University of Tasmania in Hobart, the amount of statistical

material covered across the school mathematics curriculum has increased since the 1990's [Watson 1998]. However, teachers are not prepared to teach this material because they have a lack of an appropriate statistical background. Professor Watson goes on to say that at the primary level, pre-service teachers may only see a small amount of statistics as part of an introductory psychology class. At the secondary level, teachers are most likely not required to take a class involving statistics as a part of their degree requirements. Therefore, professional development in this field is a necessity. Professor Stephen Lancaster from the University of California at Fullerton agrees in his belief that "Continuing professional development is an important strategy to remedy the lack of teachers' statistical content and pedagogical content knowledge" [Lancaster 2008].

Curriculum materials are collected in Australia as a part of the Australian Education Council (AEC). In the early 1990s, *A National Statement of Mathematics for Australian Schools* was published, which included the statistical content to be covered within a section entitled "Chance and Data." The purpose of this document was to make sure students had "a sound grasp of concepts in the areas of chance, data handling and statistical inference (which is) critical for the levels of numeracy appropriate for informed participation in society today" [AEC 1991]. Later, more documents were published by the AEC which state the skills that each student is expected to master at each grade level.

Teachers need to understand, at a minimum, the material that they are required to teach to their students. However, even this isn't adequate. A study conducted at the University of Waikato in New Zealand concluded that if pre-service teachers learn statistics at all, the material is no more sophisticated than the concepts that they are actually going to teach, and this is not acceptable [Sharma 2007]. Consequently, the content knowledge that teachers need in order to relay information effectively needs to be analyzed and re-evaluated.

In Australia, each state sets its own requirements and educational curriculum standards. However, according to Liya Perelman of NESU, the development of a national curriculum framework is currently in process [personal interview, 2009]. The state of Victoria follows the curriculum standards put in place by the Victorian Curriculum and

Assessment Authority (VCAA) [VCAA 2007]. The name of the curriculum framework that the VCAA has in place for the Victorian school community is the Victorian Essential Learning Standards (VELS). The VELS clearly state all educational requirements of all subjects for students in Victoria from Preparatory to Year 10 (levels 1-6). The other states of Australia have similar curriculum standards as well, with only small variations.

In their early years, students begin learning basic mathematics and simple situations involving probability and statistics, e.g., discussing popular false notions such as a six being harder to roll on a die than any other number. As the students move further along, they are challenged more with tasks such as drawing and building multiple types of graphs from data and specified rules given to them. Students are encouraged to find ways to relate everyday issues and problems with statistics in the classroom and vice versa. This is aimed to help students not only understand statistics more easily, but also the relationships between statistics and their everyday lives.

The VELS specifically describes basic statistical concepts that should be taught to students in levels four through six. At level four, students perform tasks such as calculating probabilities using words, fractions, and simple decimals [VCAA 2007]. They simulate chance outcomes using spinners and dice. Students at level four should learn about different types of data such as categorical, numerical, discrete, and continuous data. They should also be familiar with basic charts and techniques to calculate measures of centrality such as mean, median, mode and range. At level five, students continue to learn about basic concepts, but now calculate new measures such as accuracy and percentage error. Technology is also introduced as students use computer software to organize, tabulate, and display data using dot plots, stem and leaf plots, column graphs, bar charts, and histograms. At level six, students perform more complex calculations and interpret their data. They learn different theorems and concepts such as the Pythagorean Theorem and trigonometric ratios (sine, cosine and tangent). Students begin to estimate probabilities based on data, and use more complex methods to display data such as Venn diagrams and tree diagrams. Moreover, students learn about populations and samples, while generating data using surveys and sampling procedures. Consequently, the Australian learning standards provide

statistical education guidelines for teachers, yet teachers still seem to be struggling to teach at these levels of detail.

2.5 Shortage of Qualified Math Teachers

A major problem in Australia has been the shortage of qualified math teachers. An Australian radio broadcast in 1999 reported that the number of math teachers had declined by 30% that year, and was expected to worsen [Barker 1999]. This problem stems from the fact that the number of University students enrolling in mathematics education programs has halved in the past decade. Additionally, according to Diane Siemen, President of the Association of Maths Teachers, "Kids just aren't being encouraged to do maths at uni, and many see teaching as a wasted career" [Barker 1999]. Part of this problem is due to mathematics majors looking for higher paying jobs in finance and IT. The lure of benefits from private companies is negatively affecting the amount of qualified math teachers in Australia.

This shortage results in lack of experience, because many of the teachers who end up teaching mathematics have little or no math background. Approximately 40% of mathematics teachers in years eleven and twelve do not have a degree in math [Trounson 2009]. The Australian Council of Deans of Science reported that over three-quarters of secondary schools are having difficulty finding qualified math teachers [Trounson 2008]. If the students are not being taught by passionate, qualified teachers, interest in the subject will dwindle. Ms. Siemen went on to say that if students aren't being turned onto math, they will not be turned on to science or technology either [Barker 1999]. This will, in turn, negatively affect the prosperity and evolution of these industries in Australia.

Another problem arises from many teachers' moving from public to private institutions [Trounson 2009]. As the few qualified teachers continue to be "snapped up by the private sector," many upper level mathematics courses are disappearing. According to the National Committee for the Mathematical Sciences, "The inequitable access to quality mathematics education is a national disgrace."

2.6 Statistics and Students

The problem involving the lack of statistics in the classroom is recognized by institutions such as the Commonwealth Scientific and Industrial Research Organization (CSIRO). CSIRO has observed that many students are not receiving the education necessary to foster greater interest in statistics for their futures. According to David Mitchell, a biologist at CSIRO who leads a group of bio-informaticians and statisticians, this lack of interest in statistics will negatively affect Australia's growth and development in the realm of scientific research [CSIRO 2005]. Mitchell stated, "The worst case scenario is that Australia will fail to capitalize on opportunities in fields like drug delivery and novel diagnostics because we don't have research statisticians to develop the new approaches to data analysis that are required."

Mehryar Nooriafshar, a faculty member at the University of Southern Queensland in Australia stated that the best way to spark students' interest in statistics is by "maximizing learning enjoyment" [Nooriafshar, 2003]. With less time spent sitting in lessons that may be dull or uninteresting to them, the students will begin to look at statistics as not only another mathematical topic, but also for its interesting applications. It is particularly important to analyze the reasons that students like and dislike statistics to develop a more effective way to teach it. According to Figure 2.1, Help at Home, Fear of Statistics, and Mathematical Inclination are all reasons why students may or may not enjoy statistics.
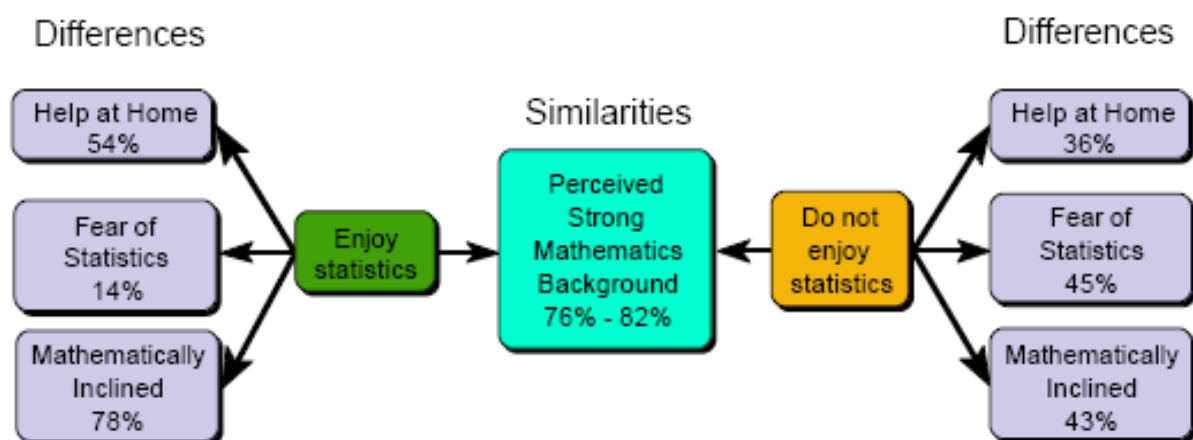
Figure 2.1: Students' Perceptions of Statistics [Nooriafshar, 2003]

From Figure 2.1, it can also be seen that perceived strong mathematical backgrounds do not play a significant role in students' feelings about statistics. This is an important point because it implies that mathematical skill does not directly correlate to enjoying statistics. Another conclusion is that almost half of the students surveyed do not enjoy statistics because they are afraid of it. This fear must be conquered through a simple, interactive, and effective presentation of statistical material by the teachers.

The fact that many students do not enjoy statistics implies that teachers may need to develop more active and entertaining ways to deliver their lessons [Nooriafshar, 2003]. Nooriafshar's study also concluded that approximately 58% of surveyed students prefer graphics and visual learning. Another study done in New Zealand coincides with Noorifshar's results, concluding that "textbook-type exercises to do with theoretical probability are insufficient to help students develop a complete understanding of chance events" [Sharma 2007]. This means that during a statistics lesson, teachers should emphasize pictorial representations of the data. In addition, a multimedia approach should be developed to entice students and show them that statistics can be fun and does not have to be intimidating.

2.7 Improvement of Statistical Literacy in Australian Schools

As teachers struggle to use statistics in their classrooms, different programs have been created to give teachers an opportunity to increase their knowledge of it. The Education Services Unit of the Australian Bureau of Statistics is utilizing the CensusAtSchool project to increase the statistical literacy of primary and secondary students across Australia.

2.7.1 Professional Development

According to the Australian Government Quality Teacher Program (AGQTP), Professional Development (PD) is a vital component that can enhance the quality of teaching, and subsequently, learning [AGQTP 2005]. It involves the use of programs outside the classroom to allow teachers to increase their knowledge in specific subject areas, and

can also serve to improve teachers' learning abilities. There are many methods of PD, and there is not one that works perfectly every time. Consequently, there is a need for several types of professional development in accordance with the learning styles of multiple teachers.

Professional development is an extremely important aspect of the teaching profession; it allows teachers to become better at their profession, which in turn, helps students learn more effectively. Across Australia, PD programs are now being conducted. These state programs target experienced teachers from both the primary and secondary levels that have at least ten years of teaching experience. They focus on subjects such as literacy, mathematics, science, technology and vocational education. In total, the Australian government has allotted AUD$97.2 million for professional development projects across the country [AGQTP 2005]. This budget was well allocated, as teachers became less hesitant when coming in contact with statistical material. Watson's study reported that "Teachers generally were not uncomfortable with statistics in their daily lives" [Watson 1998].

There are many opportunities for teachers to take part in professional development in Australia. The AGQTP cites several methods, including workshops, accredited sources, online learning, mentoring, and action learning. Workplace learning may take place through action research, coaching, and mentoring. Learning may also take place in other locations such as certain institutions (tertiary level education) or online. Online learning has become much more popular since the rise of the Internet; the Australian Bureau of Statistics and the CensusAtSchool programs have a wide variety of resources available on their respective websites. Conferences and seminars are also popular ways to take part in professional development programs. "Professional learning is more likely to improve student learning outcomes if it increases teachers' understanding of the content they teach, how students learn that content, and how to represent and convey the content in meaningful ways" [AGQTP 2005].

2.7.2 Effective Professional Development Methods

Professional development resources may be delivered in a variety of ways, some of which prove to be more useful than others. In a paper presented at the annual meeting of the Research Council of Diagnostic and Prescriptive Mathematics, a four step process was discussed for aiding in teachers' statistical data use: (1) posing questions, (2) collecting data, (3) analyzing data, and (4) interpreting results [Bright, Berenson, & Friel, 1993]. At conferences in the 1990s, various methods of professional development were discussed which took into account the new and upcoming use of computer technology. It was noted that one of the challenges for the future was "the professional development of teachers of data handling" [Shaugnessy, Garfield &Greer 1996].

Another study, conducted in 1997, concludes that when beginning a professional development program, coordinators need to be wary of how much content knowledge teachers actually have [Watson & Moritz 1997]. In addition, they must be aware of materials that teachers and their students can access. For example, some schools may have sufficient graphing calculators for each student to use, and others may not. This same study concludes that teachers prefer professional development coordinators who have experience both in the classroom and with probability and statistics. Another suggestion is to use as many forms of media as possible when providing PD, from written sources to videos to online resources. Finally, it was noted that "hands-on" learning is the most beneficial for teachers.

The study done by the Australian Government Quality Teacher Program [AGQTP 2005] came to several conclusions about the most effective Professional Development Programs:

- Effective PD programs draw teachers into an analysis of their current practice in relation to professional standards for good practice.
- Effective integration of new skills requires programs to have a clear theoretical foundation supported by research, modelling in real settings, and opportunities to practice the new skills and receive feedback from a coach or supporting teacher.

- Effective Professional Development programs lead teachers to examine their students' work in relation to external reference points or standards.

The AGQTP study stresses that teachers should learn from and observe each other. The term used is "collaborative analysis," in which teachers cooperate with each other to become better teachers. This report also states that the methods in which teachers use external reference points or standards are the most critical component of effective programs. The United States Department of Education has also determined its own standards for good professional development [US Department of Education 2003]: Professional Development

- Focuses on teachers as central to student learning, yet includes all other members of the schools community
- Focuses on individual, collegial, and organizational improvement
- Respects and nurtures the intellectual and leadership capacity of teachers, principals, and others in the school community
- Reflects best available research and practice in teaching, learning, and leadership
- Enables teachers to develop further expertise in subject content, teaching strategies, uses of technologies, and other essential elements in teaching to high standards
- Promotes continuous inquiry and improvement embedded in the daily life of schools
- Is planned collaboratively by those who will participate in and facilitate that development
- Requires substantial time and other resources
- Is driven by a coherent long-term plan
- Is evaluated ultimately on the basis of its impact on teacher effectiveness and student learning; and this assessment guides subsequent professional development efforts

In conclusion, the above points are the defining factors of a truly beneficial Professional Development program. By implementing these techniques, a PD program will be created with its greatest potential for both teachers and students.

2.7.3 The Australian Bureau of Statistics' Professional Development Materials

From 2006 until 2008, the CensusAtSchool professional development was conducted as face-to-face training sessions with teachers. These would typically be held at host schools throughout Australia, and teachers from neighboring schools would be invited to attend. These sessions were marketed in schools that were registered with the CensusAtSchool project [ABS 2009]. Two types of workshops were offered to teachers. Most were conducted at a host school with each teacher sitting in front of his own computer. One consultant from the ABS would present various topics to the group and provide ideas about how teachers could use CensusAtSchool in their classrooms. At the end of the session, the participants would receive a DVD which reiterated the material presented in the workshop. This DVD was produced in 2006 as an additional resource for those who could not attend the workshops. In addition, this DVD was made free to the public so that anyone could contact the ABS and request a copy. The second type of workshop was conducted at conferences. These were lecture style presentations which involved one consultant demonstrating the material via a projector to a large group of individuals.

In 2008, however, the ABS's budget situation forced them to look at other methods of delivery. Additionally, they were not able to reach teachers in remote areas who were interested in attending workshops. Although Australia is approximately the same geographical size of the United States, it has a dispersed population of only 21,000,000 [Central Intelligence Agency 2009]. In July of 2008, the DVD was divided into individual tutorials. These tutorials were uploaded onto the Internet to enhance access for all and reduce travel costs. The ABS also hoped to reach more teachers through popular online learning spaces such as TeacherTube and YouTube.

In 2008, the main method of delivery was a combination of online tutorials and CensusAtSchool workshops conducted at conferences. At these conferences, the DVD would be distributed. The ABS knew that there were teachers interested in the CensusAtSchool program based on the large number of attendees at the conference workshops. However, according to NESU employee, Liya Perelman, they were not certain as to how much information was lost from the face-to-face sessions when using the DVD, and

if online tutorials were sufficient for teachers to feel confident introducing the project to their students [personal interview, 2009]. The ABS was seeking feedback on the efficacy of the new PD delivery method and to determine if the content is still relevant and useful for teachers. They wanted to ascertain whether the DVDs and online videos were being used merely to strengthen Microsoft Excel skills or if teachers were actually interested in getting involved in the CensusAtSchool program. Moreover, the NESU staff members were concerned about their delivery methods in this time of ever-changing technologies. They wanted to know if these schemes were outdated and if they were the best option for teachers. In addition, they wanted to uncover any critical information that the Professional Development resources may be missing. Therefore, the goal of this project was to evaluate the CensusAtSchool Professional Development materials by analyzing and improving the content of the tutorials, their delivery method, and their effectiveness.

3.0 Methodology

The goal of this study was to determine the efficacy of the DVD and web-based professional development materials available to primary and secondary teachers in Australia through CensusAtSchool and the Australian Bureau of Statistics. The objectives of this project were:

1. To assess the DVD and web-based professional development resources that the ABS currently supplies in order to increase teachers' knowledge of and ability to teach statistics in the classroom

2. To determine the impacts of these resources on the teachers' confidence to teach statistics

3. To propose suggestions which are necessary to improve the efficacy of the professional development tutorials

4. To explore and suggest other methods of delivery for the professional development resources

In order to satisfy the objectives of this project, the project team developed the following research questions that were addressed during the study.

1. Do the DVD and web-based professional development resources that the ABS currently supply increase teachers' knowledge of and ability to teach statistics in their classrooms?

2. Do these resources increase or decrease teachers' confidence in teaching statistics?

3. What aspects and sections of the tutorials need improvement, and how can they be improved?

4. What are other potential methods of delivery for the professional development resources?

The team believed that answering these questions was imperative to fulfilling the objectives and subsequently achieving the overall project goal. Originally, the team hoped that the majority of the data would be collected through operational evaluation sessions. Unfortunately, upon arrival in Melbourne, new methods needed to be designed. Due to

timing and scheduling constraints on the project and with the schools, different forms of data collection were best for different participants. The methods used included operational evaluations at participating schools, an electronic survey, and phone interviews with administrators and teachers. Collectively, these three methods allowed the team to gather data to propose suggestions to the ABS.

3.1 Implementation

The processes by which the team collected data were varied and relatively complex. Contacting schools and teachers was done through the use of personal contacts and cold calling of schools. The team first used the personal contacts of ABS employees Ian Wong and Pat Beeson. Wong is a member of the Australian Association of Mathematics Teachers (AAMT), which publishes a message board. He posted a request for volunteers to help with the study, and the electronic survey (discussed in detail in Section 3.3) was then forwarded to teachers who expressed interest. Beeson forwarded the electronic survey to the Education Officer of the Geography Teachers Association of Victoria (GTAV). The Education Officer then forwarded the e-survey to the network leaders to distribute to schools across Victoria.

The team also completed cold calls to primary and secondary schools across the Melbourne area. In this case, cold calling involved phoning schools without prior notice and asking for their participation in a research study. The team hoped to schedule operational evaluations at the schools. If a school administrator (usually the Professional Development Coordinator or Deputy Principal) could not schedule a session but still showed interest, the electronic survey was sent for distribution to the school's teachers. When the electronic survey was not a possibility either, the team asked for a short phone interview to gather generalized data about professional development and the CensusAtSchool program. The phone interview process is discussed in Section 3.4 and the script used for the cold calling can be found in Appendix A.

A second set of cold calling was also performed during the week of April 13th to April 17th. During this time, the team contacted schools in Northern Territory with the specific

intent of conducting phone interviews. Operational evaluation sessions in Northern Territory were not feasible due to the geographic distance. Electronic surveys were also not utilized in this instance due to time constraints; there were only two weeks left until the project deadline and the team needed to analyze the results. This would not have been possible with the distribution of the e-survey at such a late date.

Additionally, two educators from universities in the Melbourne area were contacted to expose pre-service teachers to the CensusAtSchool materials and solicit their opinions on the program. Introducing pre-service teachers would give the ABS insight their preparation (or lack thereof) to successfully teach statistics in their classrooms. Lynda Marie Ball, a professor of Maths Education at the University of Melbourne, and Susie Groves from the Department of Education at Deakin University were sent e-mails explaining the electronic survey. However, due to time constraints and lack of response, this avenue could not be explored.

Table 3.1 shows a timeline of the tasks completed by the team during the on-site portion of the project. The first few weeks in Australia were used to make necessary changes to the implementation of the project. The second and third weeks focused on cold calling schools and contacting participants to set up the operational evaluation sessions as well as sending out the electronic surveys. During the weeks of the Victorian school vacation, no operational evaluations were conducted, and the time was used to carry out the phone interviews with schools in Northern Territory. The operational evaluation sessions were conducted at Victorian schools during the first week following the school vacation. The data were analyzed and the final report and presentation were edited and prepared during the last three weeks in Melbourne.

TASK	Weeks in Melbourne						
	1	2	3	4	5	6	7
Edited Project Methodology	■	■					
Conducted Cold Calling of Schools		■	■				
Conducted Phone Interviews				■	■		
Conducted Operational Evaluations						■	
Analyzed Data					■	■	
Prepared Final Presentation and Report						■	■

3.2 Operational Evaluations

Operational evaluations were deemed the most effective method to satisfy each of the objectives. They were used to understand teachers' ranges of attitudes and levels of understanding of the professional development software. Groups of teacher participants gathered in a classroom and followed the CAS PD materials, answering several survey questions along the way. Their opinions were used to gain insight into the effectiveness of the PD materials. An observational assessment was also used to gauge participants understanding and feelings about concepts, definitions, and delivery methods based on their reactions and behaviors during the operational evaluation.

3.2.1 Planning the Operational Evaluation Session

The ABS has internally published a document which describes the appropriate methods for conducting meaningful focus groups. These guidelines encompass the aspects of the focus group sessions held by the ABS such as the comfort levels of the groups as well as the types of participants [ABS *Focus Groups* 2007]. For example, homogeneous groups (those including teachers from the same schools) are more effective because participants are more comfortable interacting with each other and are more likely to share honest

perspectives on certain matters. Also, recruiting participants from different levels of employment, such as a principal and a newly hired teacher, may hinder participation and skew results. Finally, every possible question and answer scenario should be screened and pretested by the team to avoid any possible areas of concern. For example, the questions should not target any specific race or sex. They also must not include any material that may be considered sensitive to any participant. Before conducting a focus group, it is important that a team be well prepared for the session. The team members should ensure that they have all necessary supplies ready for the focus group, including nametags. Nametags are helpful for promoting use of first names, which allows for a more comfortable and personal environment. The team should practice the session a number of times and complete a preliminary trial to help the session run more smoothly.

These guidelines provided by the ABS were utilized in designing the operational evaluation sessions. They state that focus groups with between five and twelve participants are most effective [ABS *Focus Groups* 2007]. For this project, each operational evaluation consisted of between two and nine teachers, and was designed to take approximately one hour. This time constraint was chosen to keep the evaluations from being too long; teachers are busy and have little free time. However, the sessions had to be long enough to obtain the necessary data and cover the indispensable material. It was important to remain flexible when entering the sessions because a participating group's adherence to a schedule can never be predicted. An outline for the session can be found in Appendix B. During the week before the operational evaluation, the team sent confirmation letters to all registered participants as a reminder of the date, time, and location of the event (Appendix C).

3.2.2 Roles

Each student of the three-member project team had a specific role to play during the operational evaluation session: (1) the principal facilitator (PF), (2) the assistant facilitator (AF), and (3), the observer/note taker (ONT) [ABS *Focus Groups* 2007].

Principal Facilitator

The principal facilitator ran the operational evaluations. The PF was in charge of directing conversation, answering questions, and making sure the participants stayed on task. The PF also ensured that all points on the agenda were covered. The principal facilitator welcomed the participants in an informal manner and made sure that they felt comfortable enough to give their honest opinions during the session [ABS *Focus Groups* 2007].

Assistant Facilitator

The assistant facilitator's job was to be aware of anything that the principal facilitator may have missed. The AF made sure that the operational evaluation was running on time, and also gave any assistance or answered any questions participants had during the sessions. The assistant facilitator was also responsible for distributing the necessary paperwork, and double checking that it was collected and filled out properly by all of the participants [ABS *Focus Groups* 2007].

Observer/Note Taker

The observer/note taker's job was primarily to take observational notes. This person sat away from the group, and refrained from speaking so as to not influence the session. This role had to be clearly identified at the beginning of the session so that the participants were very clear as to the identity and purpose of each individual in the room. In addition to taking notes, the observer/note taker conducted an observational assessment of the operational evaluation. This meant that the ONT had to observe the participants' reactions to the PD materials.

3.2.3 Observational Assessment

In addition to the survey, worksheet, and questionnaire, the efficacy of the materials was measured through an observational assessment, which allowed the note taker to easily record the teachers' behavior. The method of using structured observation, a sub-division of

the basic observational assessment, was deemed most appropriate for this project. A structured observation was performed by creating a list of detailed behaviors [Davis & Humphreys 1985]. During the operational evaluation, the observer/note taker tallied the number of times that each participant demonstrated a particular behavior. Although the observation checklists took time to create before the operational evaluation, the project team benefited during the program by being able to quickly assess teachers' initial reactions to the PD material. The observational checklist can be found in its entirety in Appendix D, and the notes gathered from the teachers' behaviors can be found in Appendix E.

3.2.4 Conducting the Operational Evaluation

The operational evaluation was conducted in three phases: an introduction phase, a video phase, and a conclusion phase. The introduction phase consisted of a basic explanation as to the purpose of the study and included the distribution of the release forms and other paperwork to be completed throughout the program. During the video phase, participants viewed three different professional development tutorials and answered short questions pertaining to the individual lessons. Lastly, during the conclusion phase, the participants completed a survey about their experiences, as well as shared personal reactions to the DVD. Due to time constraints, the operational evaluation only centered on the DVD sections that exemplified particular statistical skills in Microsoft Excel, those being sections four through seven.

Introduction Phase

The purpose of this section was to familiarize the participating teachers with the feedback received by the Australian Bureau of Statistics about the demand for statistical resources, particularly primary school teachers, and to inform them of the process that was going to be followed in the operational evaluation. The team members introduced themselves to ensure that the teachers felt comfortable asking questions and continued to describe the project by illustrating the (survey) research questions and objectives; this helped to explain the main reasons for completing the study. The teachers were also given a background survey to complete. This survey gathered preliminary and demographic data

about the teachers and their current confidence in using statistics and Microsoft Excel in their classrooms. This survey may be found in Appendix F.

Each participating teacher received a release form to read and sign. The form was created based on WPI Institutional Review Board (IRB) guidelines, and prior Interactive Qualifying Projects done with the Australian Bureau of Statistics. This form described the purpose and objectives of the study, explained that there were no risks associated with the study, and ensured the anonymity of the participants. The form reiterated that the study was voluntary, meaning that participants did not need to participate if they did not wish to do so, and were free to leave at any moment. It was made clear that the participants had as much time as was necessary to read and sign the release forms. The form in its entirety may be found in Appendix G.

Video Phase

This phase was the main segment of the operational evaluation and consumed a majority of the time.   Its purpose was to allow teachers to view the tutorials and record their initial reactions. A video worksheet was utilized to garner basic comments from the participating teachers regarding the professional development tutorials. Simple questions were asked concerning each section of the tutorials. For example, in regards to the section describing the use of the Countif function, the question was asked, "Were you already aware of the Countif function and its uses?" This worksheet helped gauge whether or not teachers had been taught basic statistical and computer concepts prior to viewing the tutorials. Time was left for general and quick comments following each section, providing participants with an opportunity to record their initial reactions. The purpose of having the participants complete a survey as they watched the videos was to have them answer basic yet specific questions about the material while it was still at the forefront of their minds. The video worksheet is located in Appendix H.

While the participants were watching the DVD, the team had the opportunity to observe the teachers' immediate responses to the material. Certain characteristics were focused on such as ease of use, comfort/confidence in completing the tasks, and degree of

confusion or understanding. When questions arose, the team members were able to answer any that the participants had. The principal facilitator and the assistant facilitator kept the program running smoothly while the note taker recorded observations of the participants as they completed the tutorials.

Conclusion Phase

Directly after watching the DVD, the participants completed a survey regarding their experiences that gathered information about the usability of the tutorials. The entire survey can be found in Appendix I. Before departing, all participants received a copy of the professional development DVD provided by the ABS. Even if they do not view them again, the participants may still show them to other teachers and colleagues; this will hopefully help expand and promote the CensusAtSchool program.

3.2.5 Team Evaluation of the Operational Evaluation

After each operational evaluation session, the team met immediately to discuss the event. They conversed about any problems that may have arisen during the session, as well as aspects of the session that seemed to go well. Each member discussed his own personal experiences and the performance of the other members. An important reason for meeting immediately after the session's end was to discuss topics and observations that could become distorted or faded with time. All members talked in detail about the observations they made. Moreover, the team concurrently conducted a brief analysis of the observations and each member wrote down his individual thoughts. These observations were compared with the surveys, and a general summary of the entire session was again discussed. The team sent thank you letters to those who participated in the operational evaluations to show appreciation for their effort and their time.

After all of the operational evaluations had been conducted, the team analyzed the data to answer their research questions. To analyze the data, first it was compiled into a central database using Microsoft Excel (Appendices J-L). Subsequently, the team identified commonalities between teachers' reactions. After all the data was sorted and catalogued,

the team used the observed trends to draw conclusions and develop recommendations for the ABS.

3.3 Electronic Survey

The electronic survey (e-survey) is a similar yet shorter version of the operational evaluation, including only the most important aspects of the session. It was designed to last approximately twenty-five minutes, and was therefore more convenient for teachers to complete in their own time. The e-survey was shortened by removing certain questions and the video tutorials. These were removed because other questions garnered more important information that was determined to be essential for gaining appropriate data for the ABS.

The e-survey begins with an introduction which is made up of questions from both the background and concluding surveys. The video worksheet follows, utilizing the online TeacherTube video tutorials of chapters four through six. Chapter seven, which is greater than nine minutes long, was left optional to keep the estimated e-survey length below thirty minutes. Although chapter seven did not cover any new statistical material, the particular presentation method of the tutorial was deemed to be beneficial enough for inclusion. The electronic version concluded with a final survey, again encompassing questions from both the background and concluding surveys. The e-survey and accompanying e-mail can be found in Appendices M and N, respectively.

3.4 Phone Interview

The final data collection method was the phone interview. This interview took approximately five to ten minutes to complete, and was much more general than its electronic and face-to-face counterparts. The questions focused on professional development, such as ways teachers hear about PD resources, or the frequency of use. Some questions also referred to teachers' use of CensusAtSchool in the classroom, but the survey primarily centered on basic professional development information. The complete set of phone interview questions can be found in Appendix O.

4.0 Results and Analysis

The project team received several different types of data from various sources. An electronic survey was utilized and responses were received from four individuals. Of the 180 schools in Northern Territory, 49, or 27 percent, took part in a short telephone survey. In addition, 161 schools in the greater Melbourne area were contacted by phone. Of these, four agreed to participate in an operational evaluation. These sessions involved 23 teachers, sixteen of whom were primary and seven of whom were secondary school teachers. The results and analyses derived from a compilation of the data from all these sources are discussed below.

4.1 Data Caveat

The circumstances were such that the team could not collect sufficient data to draw distinct conclusions. Therefore, the conclusions drawn in the following sections are only suggestive. Several factors contributed to the lack of response; the two week Victorian Schools' term break and the limited availability of teachers had the greatest impact. The vacation took place from 3 April to 20 April, in the middle of WPI's seven week term in Melbourne, which made it very difficult for us to maximize the participation of Australian teachers. The vacation prevented any operational evaluations or phone interviews from taking place in Victoria during this time period. Other states were on vacation then as well, including New South Wales, Queensland, South Australia, and Western Australia. Our difficulties were further compounded by teachers' limited availability.

During the cold calling process to schools in greater Melbourne, the project team learned quickly that teachers do not have very much free time. The only block set aside at schools for all teachers to meet in one place occurs during staff meetings, which can happen as often as once per week or as infrequently as once per term, depending on the school. Furthermore, in these meetings, administrators have pre-planned agendas which are often unrelated to professional development. Taking time away from these meetings was something that principals were not likely to do on such short notice, and any professional

development sessions that occur during these meetings are generally scheduled very far in advance. To combat this setback, the project team stressed the short duration of the operational evaluations during the phone conversations to ensure school administrators that they would benefit from the sacrificed time. Since teachers were generally very busy just before and just after the break between academic terms, we had a very small window for operational evaluations to be conducted. Many administrators showed great interest in the program, but could not schedule a session due to the short timeframe of the project.

Once the team realized that scheduling operational evaluations was going to be more difficult than had been anticipated, we developed a plan to call schools in Tasmania to conduct telephone interviews. Tasmania was a good alternative target state because there was not a scheduled term break like that in schools in other areas of Australia. However, the week scheduled for this cold calling fell in the middle of the Tasmanian schools' Easter vacation, so our group had to wait until the schools in Northern Territory returned from holiday on April 13th to begin conducting telephone interviews there.

Another of our major obstacles was due to the fact that teachers and administrators in the Victorian schools were very difficult to reach. Many times our call would be transferred to multiple receptionists before being sent to a voice mail box; most calls were never returned. In total, 161 Victorian schools were called; 115 were primary and 46 were secondary schools. During the phoning process, the team actually spoke to people (either receptionists or administrators) at 100 schools. Of these, only four schools had the time and teacher availability to conduct operational evaluation sessions. In comparison to schools in Northern Territory, Victorian schools were frequently larger and their administrators busier and therefore less likely to help with the evaluation.

The team had greater success contacting secondary as compared to primary schools. Furthermore, a higher percentage of secondary schools wanted electronic surveys, but a higher percentage of secondary schools were also not interested in helping at all, possibly because administrators simply did not have the time. The raw data from the cold calling can be found in Appendix P.

In Australia, many deputy principals and professional development coordinators are also teachers. Therefore, one challenge was to find the times most likely to reach them via the cold calling. After calling schools at different times of the day, we concluded that the best times to call the primary schools occurred during the morning recess, which was generally around 11:00 or 11:30am. Another good time to call was during lunchtime. The best results for secondary school were generally obtained in the early afternoon. Later in the day, teachers and administrators were interested in cleaning up and going home after the students left. If they were still at school after hours, there was generally a range of small meetings scheduled.

The electronic survey was also sent to interested teachers from the cold calling just before the break in hope that they would take advantage of their increased free time to complete the survey. The team had very little success in using electronic surveys, however, as teachers chose not to respond. We gathered the majority of data from the operational evaluation sessions and the phone interviews.

4.2 Preferred Delivery Methods

Using the operational evaluations, the phone interviews, and the electronic surveys, the team was able to gather data regarding teachers' preferred delivery methods for professional development materials. Furthermore, in this and all of the remaining sections, the total number of responses gathered is shown in the bottom right corner of the graphs. The teachers were asked about the sources from which they most commonly heard about PD opportunities. Figure 4.1 shows the distribution of the responses:
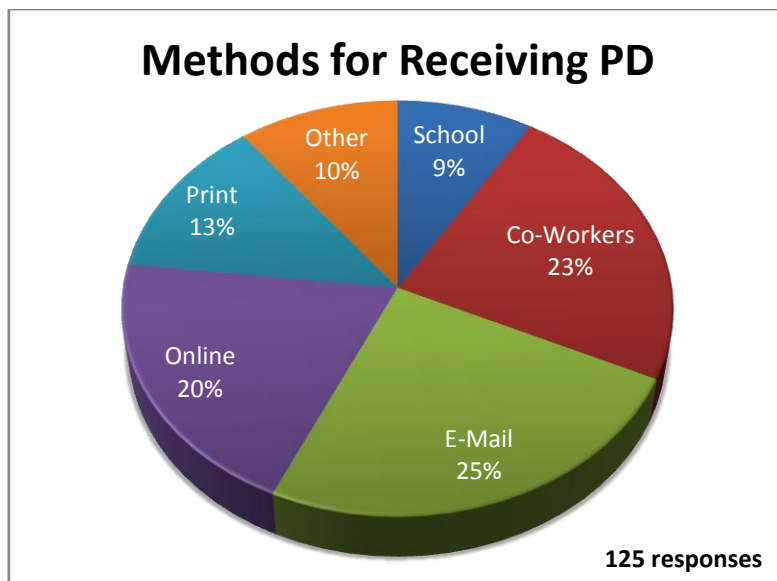
Figure 4.1: Teachers' Preferred Methods for Receiving Information Regarding PD

The data indicate that teachers rely most on e-mail for information about professional development. Closely following e-mail, however, is information from co-workers. This makes sense, as teachers may initially look for PD as individuals, but then inform their colleagues when they find new and interesting pedagogical material. Next, teachers find PD from different online sources, including websites and advertisements. Following online sources, the next most popular source for PD is print media, e.g. newsletters and other teaching publications. This relatively high percentage surprised the group, as the team assumed that any publications could be easily obtained through the Internet. This may not be true, however, because a significant amount of data was collected from schools in Northern Territory where Internet access may be significantly less.   Also unforeseen was the lack of information coming from schools. It seemed that administrators were not relaying information about professional development to teachers as often as was expected. The category labelled "Other" mostly encompasses professional networks and particular teachers associations such as Education Network Australia (EDNA), the Australian Association of Professional Development, and other state education departments. Based on these results, it appears that email and other online sources are utilized most frequently in the quest for professional development opportunities. The NESU does advertise every year, including sending materials to schools, placing CAS information in state and national education journals, submitting articles to education magazines, journal, newspapers and online teacher notification systems, faxing materials to schools, and holding conferences

[ABS 2009]. These methods do not entirely match teachers' preferences, however, as NESU focuses more on print materials instead of online sources.

The team also inquired about teachers' preferred forms of professional development. Figure 4.2 shows the breakdown of these responses:
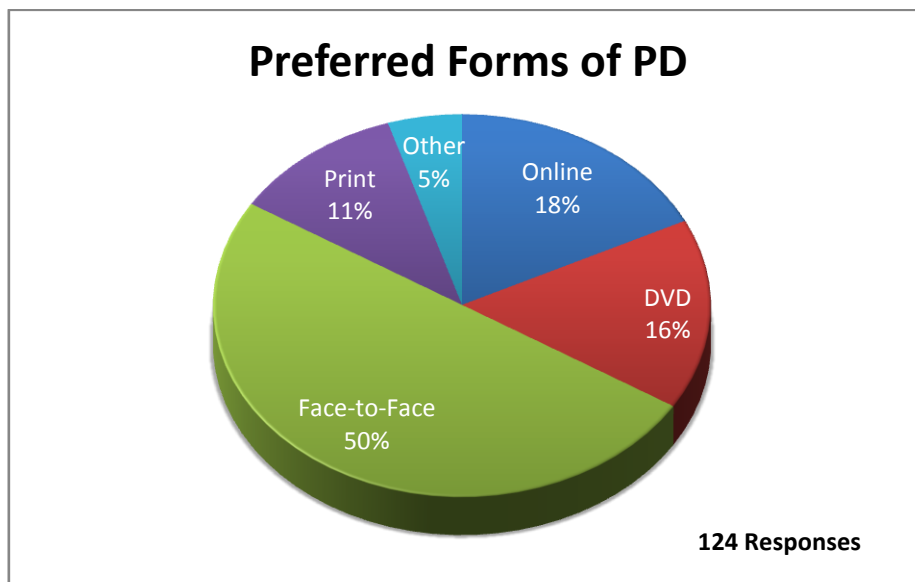
Figure 4.2: Teachers' Preferred Forms of Professional Development

These data indicate that a majority of teachers prefer face to face workshops for professional development. During the phone interviews, many teachers stated that they wanted face to face workshops because they were less boring. Unfortunately, for economic and geographic reasons, the NESU had to stop their use of workshops, thus leaving teachers without one preferred form of PD. Teachers also recommended that good professional development included engaging presentations and interactive materials. A smaller number of teachers wanted DVD and online sources, and even fewer were looking for print media. In this case, "Other" referred primarily to satellite conferencing. The main conclusions based on these data include:

- Teachers learn about PD opportunities most often through email and other online sources
- Teachers prefer PD in the form of face to face workshops.

4.3 Remote vs. Urban Schools in Northern Territory

As the number of operational evaluations scheduled remained small, the NESU suggested that the project team conduct phone interviews in Northern Territory (NT), as it was the only state not on vacation. The team asked participants in the phone interview if they considered their schools to be located in remote or urban locations, to determine whether some schools' secluded locations affected their professional development experiences. When the Northern Territory schools returned from break, the project team attempted to contact 180 of them to conduct a short telephone interview, with 27 percent success (49 schools). It was noted that teachers and principals in NT were generally much easier to reach and more responsive; many returned calls in a timely manner. This may have been a result of the fact that NT schools had fewer students on average than those contacted in Melbourne. Despite the small number of teachers per school, the Northern Territory teachers were more apt to give a five minute phone interview than those in Victoria.

The conditions at schools in Northern Territory were very different from those of schools in Victoria. For example, one man told us that he was the only teacher and the principal at his school. In addition, many schools needed to tailor programs to students who do not speak English as a primary language. These unique aspects of schools in Northern Territory set this state apart from Victoria, and it is important to take these differences into account when developing professional development resources.

There were additional circumstances in remote schools that the project team did not anticipate. For example, when asked the number of hours of professional development that her staff completes, one principal responded that most teachers have short term contracts. They are referred to as relief teachers and stay at that school for only one term. Therefore, it is not economically viable for the school to pay to send these teachers to professional development sessions. Another teacher expressed strong feelings when asked why she completed no professional development during the year. Being the only teacher, she explained that she would have to close her school in order to attend a professional development workshop, and that professional development was not important enough for

her to close down school. Other teachers expressed opinions that are quite the other extreme. Despite their geographical location, many teachers believe that professional development enhances their quality of teaching and are willing to do what it takes to attend the most beneficial types of sessions. Figure 4.3 shows the average number of professional development hours that teachers in Northern Territory complete during a single academic year.
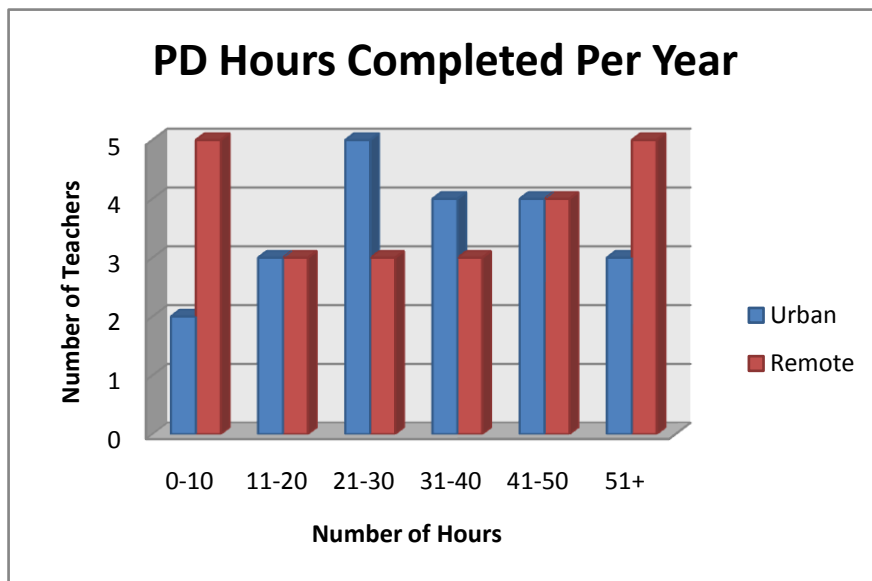
Figure 4.3: Completed PD Hours in Northern Territory

According to the figure above, the distribution of PD hours completed each year is different with respect to remote and urban schools. Although the average numbers of PD hours between the two types of schools were extremely similar, the graph of the PD hours above showed that their distribution is in fact quite dissimilar. The average amount of PD completed each year by teachers in urban schools is 38.3 hours, while the average amount completed in remote schools is 39.3 hours. However, the data gathered from urban schools follows a fairly normal distribution, while the data from remote schools shows a more bimodal distribution. They indicate that a large number of teachers from remote schools participate in only 0-10 hours of professional development each year, while a relatively small number from the urban schools participate in such a small amount of PD. In contrast, a greater number of urban school teachers take part in an average amount (21-30 hours) of professional development. The team expected to see skewed curves with more hours for

urban schools and fewer hours for remote schools, but it was surprising that teachers at some of the remote schools completed a large number of hours. In fact, more teachers in remote schools complete greater than 51 hours of PD each year. This mixture of data implies that location does affect the amount of time spent on professional development each year; according to the graph, urban school teachers complete an average amount of hours, whereas remote school teachers complete most hours on both extremes of the graph. However, nothing can be said regarding the quality of the professional development in Northern Territory.

Teachers were also asked about their preferred delivery methods for professional development. Each participant was asked to state his or her opinions as both an administrator and a teacher. The responses to these questions can be viewed in Figure 4.4.
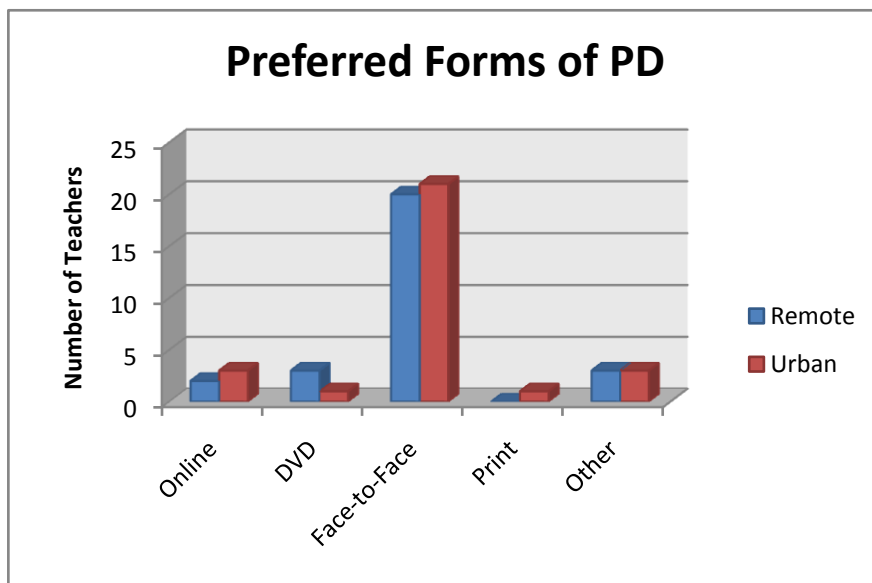
Figure 4.4: Preferred Forms of PD in Northern Territory

It strikes the project group as ironic that even those in the most remote areas still want face-to-face professional development sessions. One teacher who answered "other" expressed that she benefited more from going to a venue as opposed to staying at school or at home to complete a session. One possible solution to this problem was suggested by a remote teacher who was very passionate about utilizing video conferences. He suggested this as a realistic way to gain the benefits of a face to face session without taking the time and money to actually travel to a venue. Despite the NT teachers' location, however, a face

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to face workshop was the most preferred delivery method of professional development in Northern Territory.

The participants were also asked how they find out about good professional development resources. The results of this inquiry can be seen below in Figure 4.5.
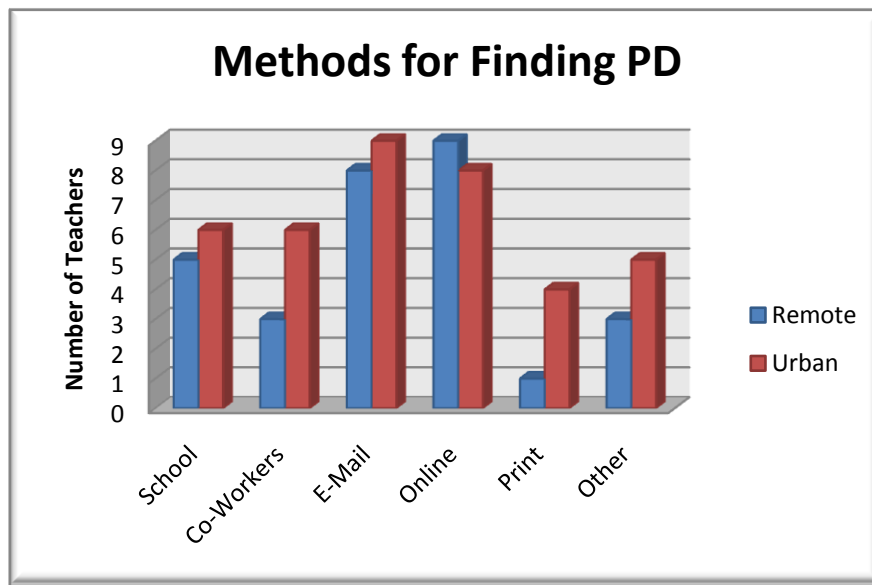
Figure 4.5: Methods Teachers Use to Find Professional Development

The data suggest that the location of the school does not largely affect how they find out about professional development. The only noticeable difference occurred with print media, as only one remote teacher claimed to use this resource, while four teachers in urban schools use it. For both locations, print was the least used method and e-mail and online were the most frequently used methods. Those in remote areas who chose "Other" often had to go out and find professional development on their own. Those in non-remote areas relied mainly on mailing lists, school networks, and the government.

Additionally, participants were asked if they had heard of CensusAtSchool (Figure 4.6).
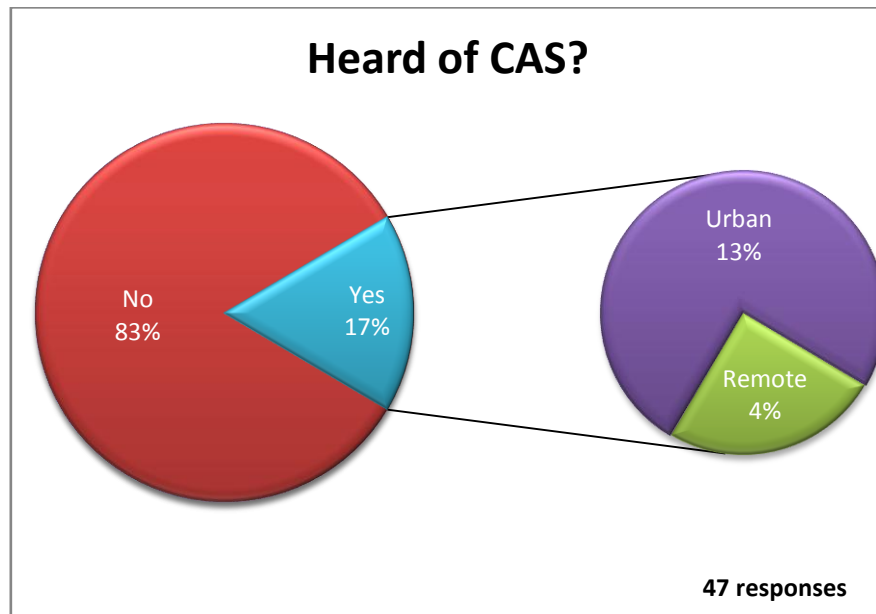
Figure 4.6: Teachers' Familiarity with CensusAtSchool

According to the figure, the number of participants who had heard of CensusAtSchool was split unevenly between remote and urban schools. Three times as many teachers in urban schools have heard of CAS when compared to those in remote schools. This split is plausible because teachers and administrators in urban schools may have access to more resources and communications than are available in remote schools.

The participants were also asked what they look for in good professional development resources. One remote teacher specifically pointed out that she wanted professional development which catered to different levels of students. The urban teachers indicated that they wanted small groups of participating teachers. They also wanted evidence and research in order to support the PD curriculum, as well as diagrams and tables to clearly display the material being taught. One main tool that the teachers desired was a suggestion concerning better ways to convey the material to their students, including techniques to keep students motivated and interested. Additionally, several teachers requested formal training in Microsoft Excel. Finally, several teachers designated that without a good selling point for CensusAtSchool, schools will not promote it.

Overwhelmingly, teachers in both remote and urban Northern Territory schools wanted hands-on, interactive, practical activities. Teachers preferred materials that were edited and presented by experienced professionals, preferably other teachers. In general, the data suggest that there is not a difference between teachers' [in remote or urban schools] PD preferences, but this may be a result of the limited number of data points that were collected; they are not sufficient to make substantial conclusions. The conclusions based on the data from this section include:

- Teachers at both remote and urban schools complete a similar average number of professional development hours each year.
    - Teachers in remote schools complete an average of 39.3 hours of PD each year
    - Teachers in urban schools complete an average of 38.3 hours of PD each year
- The distribution of urban teachers' PD hours follows a normal pattern, while the distribution of remote teachers' PD hours is bimodal.
- A larger percentage of teachers in urban schools had heard of CAS when asked by the team, but overall, very few teachers in NT were familiar with the program.

4.4 Primary vs. Secondary Teachers' Preferences

When conducting the operational evaluations at schools in Melbourne, the team noted whether participants were primary or secondary school teachers and/or administrators in order to discern the different perspectives that each type of teacher had on the CensusAtSchool materials. After collecting and analysing the data regarding the operational evaluations, it seemed to be clear that there were differences in opinions about the CAS material amongst the two groups of educators.

The professional development tutorials have a strong focus on introducing simple Microsoft Excel tasks while incorporating the CAS information. Although many of the primary school teachers found these tutorials helpful in teaching these basic Excel tasks, most of the secondary teachers found the tutorials to move too slowly and to be highly

repetitive; this can be seen in Figure 4.7 where the graph is skewed to the left. With the primary school teachers, the graph was skewed to the right, showing that more felt the pace of the tutorials was too fast rather than too slow (Figure 4.8).
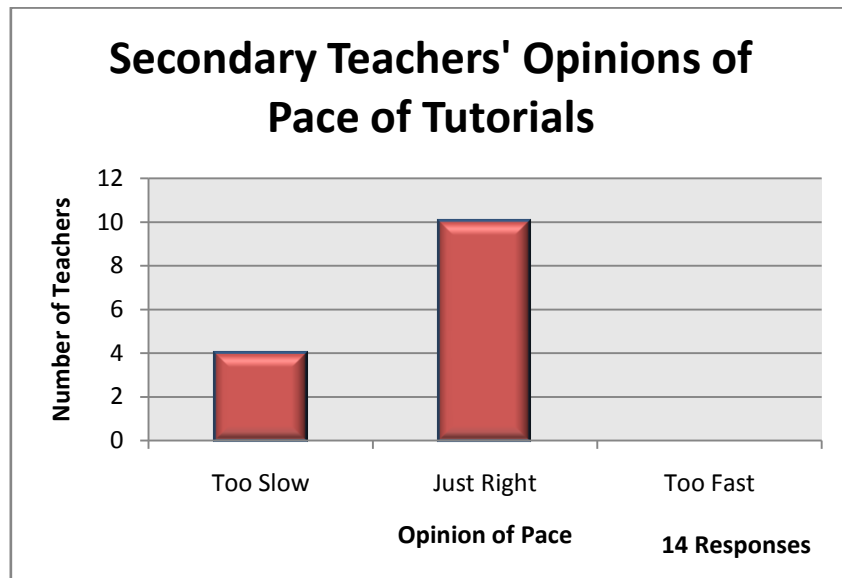
Figure 4.7: Secondary Teachers' Opinions of Pace of Tutorials
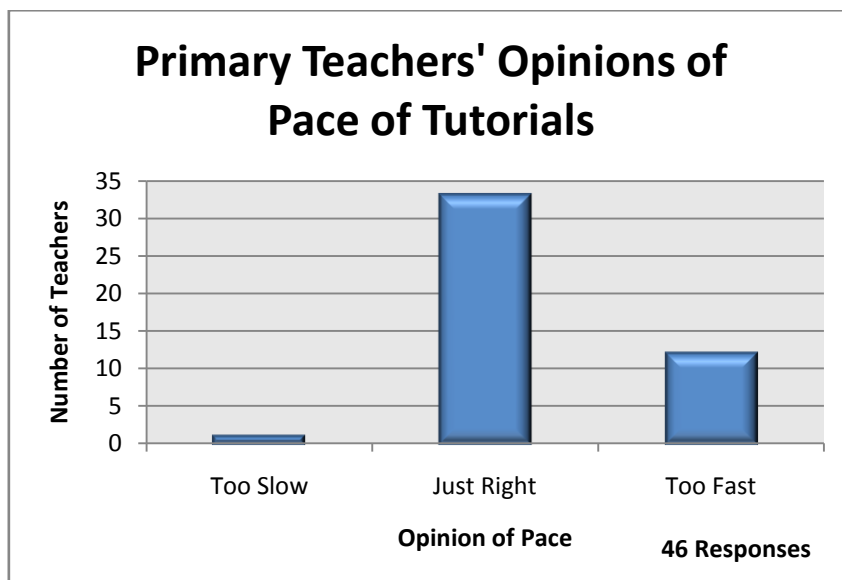
Figure 4.8: Primary Teachers' Opinions on Pace of Tutorials

It is reasonable that some secondary teachers found the pace of the tutorials too slow, while none found it too fast; all of the secondary teachers that attended the sessions were mathematics teachers. They discussed many aspects of the tutorials which they

thought were unnecessary. Many teachers agreed that showing how to complete simple tasks, such as making a border, does not need to be shown more than once throughout the tutorials. Consequently, the data imply that the secondary teachers have a higher level of experience using Excel (Figure 4.9).
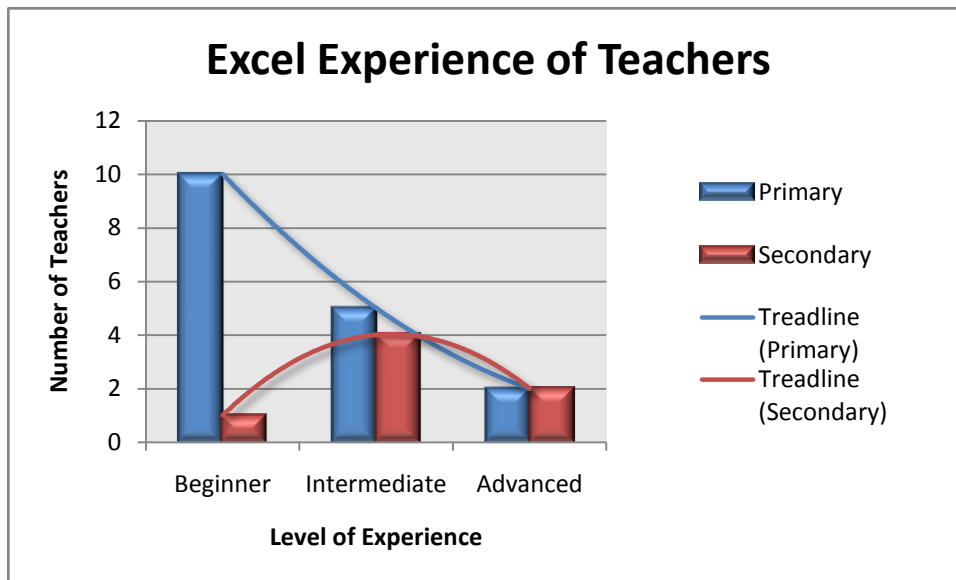
Figure 4.9: Excel Experience of Primary and Secondary Teachers

Another topic that was studied was teachers' levels of confidence while using statistics in the classroom. Although teachers may understand statistics and be able to read charts and analyze data, some may not feel comfortable teaching it to students. The data suggest that secondary teachers had a higher confidence level than primary teachers when teaching statistics in the classroom (Figures 4.10 and 4.11). This is logical, seeing as the surveyed teachers were primarily math teachers, and secondary teachers in general are required to teach a wider spectrum of mathematics.
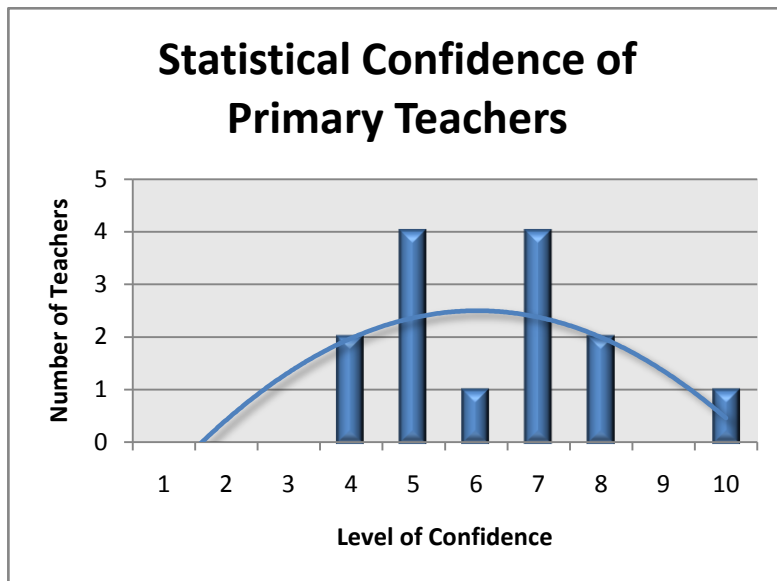
Figure 4.10: Confidence of Primary Teachers in Teaching Statistics
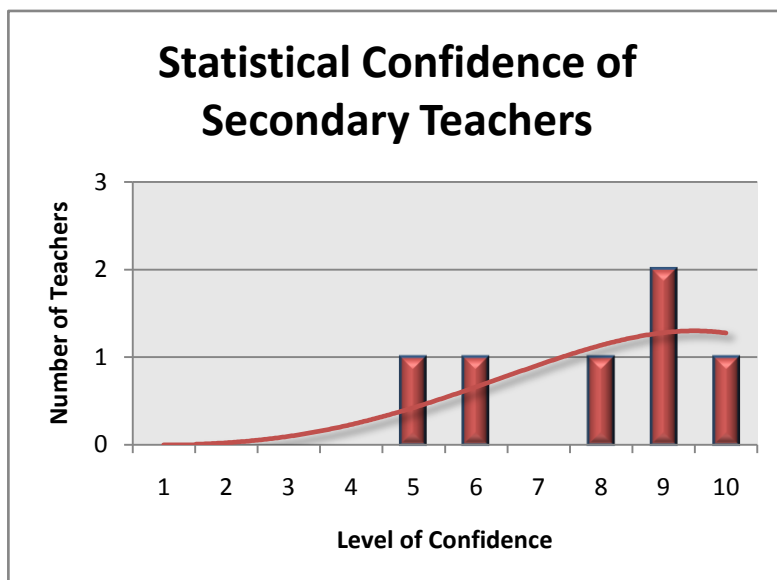
Figure 4.11: Confidence of Secondary Teachers in Teaching Statistics

Overall, the data indicate that there is a larger difference in opinion between the primary and secondary school teachers than the NESU originally thought. Although the quantity of data that was collected may be small, the limited results clearly suggest that the interests of primary school teachers and secondary school teachers are significantly different. From these data, the following may be concluded:

- Secondary teachers are more confident than primary teachers in using Microsoft Excel and general statistics
- Secondary teachers found that the tutorials moved too slowly.
- Primary teachers found that the tutorials moved too quickly.

4.5 Further Use of CensusAtSchool in the Classroom

After analysing personal preferences of teachers and positive and negative reactions to the tutorials, the project team considered whether the professional development materials actually encourage teachers to use the CensusAtSchool program in their classrooms. At the operational evaluation sessions, teachers were specifically asked whether they planned on using CensusAtSchool. The teachers' responses suggested that after viewing the materials, they had gained an interest in using the program, and would utilize CensusAtSchool to help increase their students' interest in statistics (Figure 4.12). One teacher's reasoning was that it "Helps children engage with contemporary methods of capturing and manipulating data."
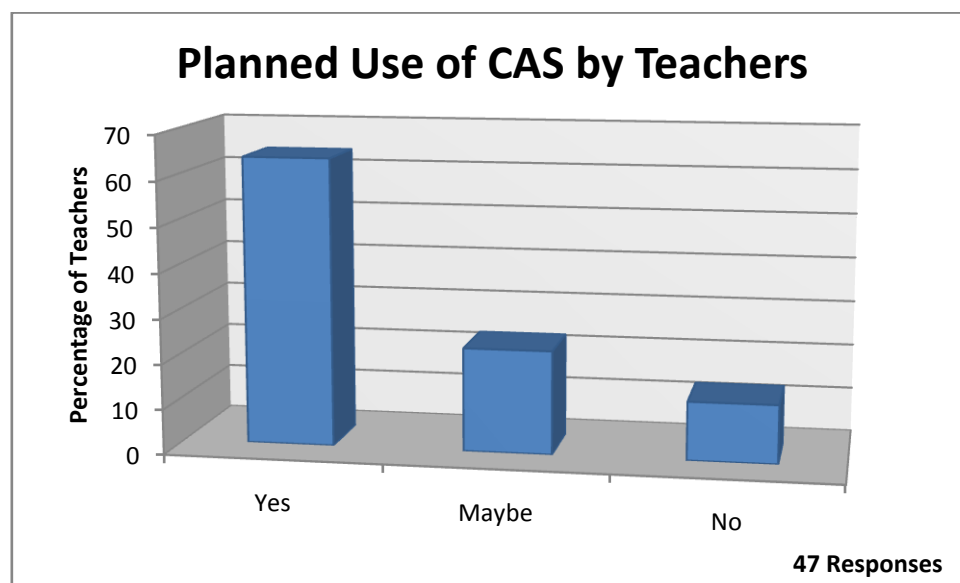
Figure 4.12: Planned use of CensusAtSchool by Teachers

Overall, many teachers stated that they would in fact use CensusAtSchool in their classrooms, as they felt that the program would make it easier for their students to

understand statistics and its applications. The following conclusion was possible based on the data from this section:

- Most teachers surveyed would definitely consider using the CensusAtSchool program in their classrooms.

In summary, there were too few data points to draw any significant conclusions, but the collected data allowed the team to make recommendations to the NESU regarding their CensusAtSchool professional development materials.

5.0 Recommendations for the ABS

Based on the data analysis, the team recommends four main changes to improve the effectiveness of ABS's professional development materials. These four suggestions include the creation of multiple versions of the tutorials, a new method of delivery, increased advertising, and a website tutorial. Although the project team received positive feedback on the CensusAtSchool material, we believe that the four proposed revisions address many of the responses and reactions from teachers and administrators.

5.1 Multiple Versions

The collected data, including many comments from participants, implied that multiple versions of the professional development tutorials should be provided. Specifically, many teachers expressed concern that the tutorials were not designed for their particular needs. Creating multiple editions of the tutorials based on teachers' skill levels and personal preferences would cater to a larger demographic and hopefully induce a better understanding of the material overall. Although producing multiple versions of these tutorials would be beneficial to teachers, this solution may not be entirely economically feasible. Thus, more research and exploration is necessary to develop a solution that will incorporate the pecuniary constraints of the ABS.

5.1.1 Primary vs. Secondary Teacher Needs

The current web-based and DVD tutorials are informative and helpful, yet some of the topics covered are geared towards primary or secondary teachers. Many teachers indicated that they wanted professional development resources targeted specifically towards their students' age range. One recommendation is to create two separate PD resource tracks, one covering material designed for primary school teachers, and the other focused towards secondary school teachers. Covering topics such as measuring the height of students' bellybuttons can be fun for younger students, but discussing in depth statistical questions associated with manipulating data is mainly helpful for secondary students. Furthermore, based on interviews from this study, many secondary teachers have already mastered basic navigation of Microsoft Excel. However, not all of the CensusAtSchool tutorials would need to be segregated into two categories; some tutorials cover important information for both primary and secondary teachers, e.g. Introducing CensusAtSchool and Overview of CensusAtSchool.

5.1.2 2003 Excel vs. 2007 Excel

Currently, the PD materials available from the ABS give instruction using the 2003 version of Microsoft (MS) Excel. The 2007 version, however, has now been available for more than a year and is filtering into Australian schools. Therefore, the project team suggests creating a version of the tutorials for the newest version of Microsoft Excel. Many changes have been made to this edition, and navigation is significantly different. Consequently, teachers may not receive the help that they need because tutorials for this new version are not available. Furthermore, as time progresses, there will be fewer people utilizing Microsoft Office 2003, and spending money on the production of 2003 professional development DVDs may no longer be practical. To remove the cost of producing unneeded DVDs, the team suggests that the MS Excel 2003 tutorials remain available for online viewing only, while the tutorials involving MS Excel 2007 are released in DVD form.

5.1.3 Microsoft Excel vs. CensusAtSchool

Many Australian teachers, particularly those teaching at the secondary school level, were more interested in the applications of CensusAtSchool and strategies for integrating statistics into the classroom experience than they were in learning Microsoft Excel. This stems from the idea that many secondary school teachers already have a basic understanding of Excel. At the same time, however, many teachers still find it helpful to have the tutorials that focus on navigation through the Excel interface. Due to this need, the team suggests the development of two types of professional development tutorials, one to describe the basic functions of Microsoft Excel, and the other to demonstrate techniques for incorporating CensusAtSchool in the classroom using practical examples. These do not have to be on separate DVDs, but in separate sections of the same DVD. This arrangement would allow teachers to only watch tutorials that focus on the material they need to review without having to sift through unwanted tutorials.

5.1.4 PC vs. Macintosh Computers

During an operational evaluation session, it was brought to the project team's attention that Microsoft Excel has different interfaces on Macintosh and PC computers. Another avenue to be explored by the ABS is the creation of two versions of the tutorials, one for each operating system. This would be particularly important in the set of tutorials which show teachers the basic functions of Microsoft Excel. However, depending on how different the two versions are, it may not be worth the time and money to develop a separate version. In having only one tutorial, another option is showing each particular task on a Macintosh interface directly following its completion on a PC.

5.2 Delivery Methods

When analyzing the professional development resources and their current methods of delivery, the team recognized that teachers are definitely accessing the current tutorials. The online video tutorials are being watched by hundreds of viewers each month, and most schools have easy access to the PD material. Ultimately, the preferred form of professional

development indicated by the teachers is face-to-face workshops (see Figure 4.2). Although the ABS stopped providing this delivery method due to financial and geographic reasons, there is an alternative. Video conferencing is becoming a popular form of contact with businesses and amongst family and friends. Hence, this technology could be used by the ABS for professional development as well. Most schools have internet access, and webcams are no longer expensive. This would enable schools in even the most remote areas of Australia to actively participate in workshops in real time with a professional development representative. There would be no travel costs and many hours of time would be saved from journeys across the country. When presented with this option, teachers showed great interest and found it to be a very attractive proposition.

5.3 Advertising

Many participants' comments indicated that one of the major problems with the CensusAtSchool program was not the actual material, but that teachers and administrators were simply unaware of the project. In fact, once the program was explained to these educators, they became excited about visiting the website to learn more about the program. Therefore, the team suggests that the NESU re-evaluate the advertising for CensusAtSchool and find a more effective way to inform teachers of the program. Advertising through email costs very little and the data suggest that it is one of the best vehicles for contacting Australia teachers (see Figure 4.1). However, we encourage a multi-facetted approach that utilizes other forms of advertisement as well, e.g. ads on TeacherTube.

Since CAS materials seem to reach school administrations, but rarely reach the teachers, another project teach suggestion is that the ABS advertise via professional organizations such as the Catholic Education Office, the individual state Departments of Education, and the Association of Independent Schools. Teachers depend on these types of organizations because of their reputations for reliability and trustworthiness.

5.4 Website Tutorial

During the operational evaluations, the project team stressed the importance of the NESU's website to the participants. Many of the excellent resources offered on the website were explained, such as games for students, a sample questionnaire to be distributed when the actual one is closed, and many projects for the classroom that were put together by the NESU. Teachers remarked that they were unaware of the resources the ABS has to offer. Hence, they and are not taking full advantage of what the website's didactic tools. Therefore, the project team suggests that the NESU creates a tutorial explaining the basic navigation of the website and describing its resources for both teachers and students.

5.4 Website Tutorial

6.0 Conclusion

Statistics plays an essential role in society as a tool to facilitate informed decision making and argument development. Therefore, statistics is too important to be left out of the classroom. The National Education Services Unit of the Australian Bureau of Statistics is utilizing the CensusAtSchool program to solve this problem by providing real, raw data for Australian students and teachers in tandem with free professional development tutorials. The goal of this project was to analyze the efficacy of these PD materials in order to increase their usage and subsequently, the application of statistics in the classroom by teachers. The team utilized several techniques to fulfill their overall goal, including operational evaluations, electronic surveys, and phone interviews. These methods provided the team with sufficient data to make suggestions to the ABS regarding the professional development materials.

The team faced many roadblocks during their time in Melbourne with respect to the Victorian schools' vacation schedule and the limited availability of teachers. Despite these tribulations, however, the team was able to offer recommendations to improve the content of the PD tutorials. These suggestions to the NESU include creating multiple versions of the tutorials to cater to teachers of different skill levels, knowledge, and needs. Subsequently, analysis of teacher opinions indicates that it is necessary to alter the delivery methods to make them more accessible to teachers throughout Australia. In particular, video conferencing can be used to reach teachers in schools in remote locations. Moreover, increased advertising of the CensusAtSchool project is an important investment which will allow the ABS to reach more teaches. Finally, adding an ABS website tutorial will encourage teachers to explore more effectively the large volume of free material that the NESU offers online.

Although the collected data was not sufficient in to make any definite conclusions, the team acquired valuable knowledge about data collection, teamwork, and most importantly, perseverance while completing this project. Therefore, we have presented suggestions that will hopefully encourage the NESU to further investigate their CAS PD materials. The project team hopes that the NESU uses the suggestions to guide the

updating of the CensusAtSchool materials so that teachers will be more confident teaching statistics in their classrooms and using it in their daily lives. The wealth of statistical resources available from the ABS will have more impact if they can be packaged in a digestible form that successfully motivates teachers to teach statistics.

7.0 Recommendations for Future Projects

There were many problems that we ran into as a group throughout the PQP and IQP process. Many of these setbacks could have been avoided if we were aware of certain information at the start of this term. This section is written to be an aid for future students, in hopes that they may avoid similar situations.

One of the largest issues that occurred centered on the relationship between the project schedule and the Victoria school calendar. If a future project entails working with schools, knowing the details of the term dates is very important. The Victorian schools' term usually starts in early February and finishes in the middle of April. There is a two week break at the end of this term before a new one starts near the end of April. For the specific term dates of the schools, we advise that a future team either asks someone at the Australian Bureau of Statistics, or views the website of the Department of Education in Victoria. School vacations are also important as they may be different than the school term breaks and do not always show up on the Department of Education website. C-Term project groups will arrive in Melbourne during the schools' summer break and D-Term groups may be affected by the term breaks when interacting with schools.

Another matter that arose was arranging meetings and focus groups with schools within Victoria. As stated in the report, teachers' schedules have very little free time, if any at all, and schools often scheduled professional development sessions and other meetings at the beginning of each term, or before the term even starts. D-Term projects should contact schools while still in Worcester; either use email or have the ABS liaison call and arrange any meetings that are necessary.

In summary, the best suggestion for all groups is to be flexible. Be prepared and ready for change, and willing to make adjustments to your projects when unforeseen situations arise. Projects are rarely completed exactly as planned, and preparing alternative methods for completing your project will make adapting to new surroundings easier.

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9.0 Appendices

Appendix A: Phone Script for Cold Calling Victoria Schools

Hi,

My name is _____ and I'm calling from the Australian Bureau of Statistics Education Services Unit. May I please speak with the Years 7 and 8 Coordinator/Assistant Principal?

My name is_____. I work with the Educational Services Unit of the Australian Bureau of Statistics, and we're updating our CensusAtSchool Professional Development materials to make them more effective. CensusAtSchool provides an online learning experience for students with an aim to raise awareness of the Australian population census and help to improve statistical literacy. We have received feedback that indicates primary/secondary school teachers are in need of better support materials.

We would like to arrange a focus group session to raise awareness of these CensusAtSchool materials. It would require no more than 45 minutes to an hour of their time and would include watching PD tutorials and completing a survey. We are very interested in obtaining teacher insights to our program. Would it be possible to set up a session of this nature with several teachers from your school?

IF YES: *Arrange Time/Date*

IF NO: Okay, that's understandable. There is also an electronic version whereby teachers can watch a few PD tutorials in their own time and complete an accompanying questionnaire at their convenience. They can e-mail us the results when they've finished. This would still be very valuable. If you know of any other teachers who may be interested we would be more than happy to receive their feedback. Can you provide me with an email address so that I may send you the materials to distribute to teachers?

> **IF YES**: *Ask for email, then forward materials within 1-2 days*

> **IF NO**: *Proceed with short phone interview (ask if it's ok to have 5 minutes of their time then lead into phone interview)*

Thank you so much for helping us with our assessment. With your input, hopefully we can continue to provide teachers with appropriate PD materials. Our email is education@abs.gov.au if you have any questions. Thanks again!

Appendix B: Outline for Operational Evaluation Session

1) Introduction (approximately 15 minutes)

→Project team members' personal introductions

→Summarize CensusAtSchool Program

→Explain what will be covered in operational evaluation

→Explain why we are conducting this operational evaluation

→Distribute Video Worksheet

→Distribute and Sign Release Forms

→Distribute and have teachers complete Background Survey

2) Tutorials (approximately 35 minutes)

→Watch videos

→Answer Video Worksheet Questions at the End of Each Designated Section

3) Conclusion (approximately 10 minutes)

→Participants complete Concluding Survey

→A short discussion of their reactions, if there is extra time

→Distribute DVDs and CensusAtSchool materials to take home

Appendix C: Confirmation Letter to Agreed Victoria Participants

Good Morning,

My name is _____, and I spoke with you yesterday regarding the Australian Bureau of Statistics's CensusAtSchool professional development session. Thank you so much for agreeing to participate! We are very interested in obtaining insights into our program, and your teachers' responses will help us to improve our current professional development materials by making them more effective and helpful.

During this assessment, teachers will going through our Professional Development tutorials. Throughout the session, a few short questionnaires will be distributed which will inquire about the content of the tutorials, their delivery method, and the needs of teachers.

We have you pencilled in our diary for 20 April from at 15:45. Please send me an E-mail back to confirm this date and time. The session should last approximately one hour. If you have any more questions, please feel free to ring me at (03) 9615-7357. Thank you so much again.

Warm Regards,

_____
Education Services
Australian Bureau of Statistics
Ph: (03) 9615 7357
E-mail: _____._____@abs.gov.au

Appendix D: Observational Checklist

Behavioral Descriptions

Confusion/Frustration
- ❒ Furrowed brow
- ❒ Loss of focus or not paying attention
- ❒ Sighing and other abnormal, discouraging sounds
- ❒ Deep Breaths
- ❒ Constantly glancing over at others instead of own computer screen
- ❒ Changing bodily orientation e.g. Shifting from left to right
- ❒ Placing hands on head
- ❒ Having trouble finishing individual tutorials on time
- ❒ Asking a large amount of questions at the end of a particular tutorial section
- ❒ Other: _____

Boredom
- ❒ Loss of focus or not paying attention
- ❒ Distracted by other people/things in the room
- ❒ Checking the Time
- ❒ Doing other tasks on the computer
- ❒ Text Messaging
- ❒ Other: _____

Positive Reactions
- ❒ Nodding
- ❒ Smiling
- ❒ Intense Focus
- ❒ Absorbed in Program
- ❒ Other: _____

Notes:

Appendix E: Notes from Observational Assessments

St. John's Primary School- 20 April 2009
Heard of CAS? 2/3

<u>Behavioral Descriptions</u>
Confusion/Frustration
- ❐ Furrowed brow
- ❐ Loss of focus or not paying attention
- ❐ Sighing and other abnormal, discouraging sounds
- ❐ Deep Breaths
- ❐ Constantly glancing over at others instead of own computer screen
- ❐ <mark>Changing bodily orientation e.g. Shifting from left to right-</mark> **Not confused, just moving around → e.g. blowing nose, moving hands around**
- ❐ Placing hands on head
- ❐ Having trouble finishing individual tutorials on time
- ❐ Asking a large amount of questions at the end of a particular tutorial section
- ❐ Other: _____

Boredom
- ❐ <mark>Loss of focus or not paying attention</mark>- **woman had already seen this**
- ❐ Distracted by other people/things in the room
- ❐ Checking the Time
- ❐ Doing other tasks on the computer
- ❐ Text Messaging
- ❐ <mark>Other:</mark> -**Yawning; Looking at other CAS materials that we handed out; funny face → could just be focus**

Positive Reactions
- ❐ <mark>Nodding</mark>
- ❐ <mark>Smiling</mark>
- ❐ Intense Focus
- ❐ Absorbed in Program
- ❐ <mark>Other:</mark> - **Taking notes** _____

Notes:

- Good Levels of focus
- Team had to explain question "Please rate your confidence in using statistics" → changed to "comfort" for later focus groups
- Teachers didn't know about TeacherTube
- Math Coordinator seems very familiar with CAS
- One teacher found Video Survey confusing

- *We didn't play Scene 5, Part 1 because it does not apply to the 2008 version of CAS on the website (i.e. Converting a CSV file)
- We needed to remind them to stop after each scene on the video worksheet
- Teachers weren't really following the directions
- 2/3 teachers have already done/viewed some of this → still engaged though
- Noted that activities/questions for kids were fun e.g. measuring belly button height
- Section 6 (first part) → It's easier to copy and paste than type in each individual
- Again, stressed that kids really like it
- Math Coordinator noticed that the tutorials are trying to teach Excel
    - Kids like using graphs of their own data → they feel empowered
- Schools are now starting to use MS Office 2007
- Trick to using CAS is that teachers need to be very familiar with it

Comments:

- Math Coordinator stated that the only reason they know about CAS is because she is proactive with it. At other schools they don't have advocates for it and therefore they don't use it
- Easy to follow
- Friendly toward children
- *We had a really good discussion!*
- "Excel has so many functions!"
- "I didn't know it could do that!"
- "Kids really like to see graphs and compare data."
- Math Coordinator seems slightly impatient → she's already seen this though
- Supplementary materials seem to interest them
- Using correct terminology is helpful with the students
- "Makes median/mode more relevant to kids"
- Working at other schools though, would have never heard of CAS
- Questionnaires are being used more now with students
- They are going to discuss it further at their school! =)

<u>Behavioral Descriptions</u>
Confusion/Frustration
- ❏ Furrowed brow**- Contemplative**
- ❏ Loss of focus or not paying attention
- ❏ Sighing and other abnormal, discouraging sounds
- ❏ Deep Breaths
- ❏ Constantly glancing over at others instead of own computer screen
- ❏ Changing bodily orientation e.g. Shifting from left to right
- ❏ Placing hands on head
- ❏ Having trouble finishing individual tutorials on time
- ❏ Asking a large amount of questions at the end of a particular tutorial section
- ❏ Other: _____

Boredom
- ❏ Loss of focus or not paying attention
- ❏ Distracted by other people/things in the room**- playing with stress balls**
- ❏ Checking the Time
- ❏ Doing other tasks on the computer
- ❏ Text Messaging
- ❏ Other: **Staring, but not at the screen; yawning**_____

Positive Reactions
- ❏ Nodding
- ❏ Smiling
- ❏ Intense Focus
- ❏ Absorbed in Program
- ❏ Other: **Generally Amused**_____

Notes:
- Good focus at beginning
- End of Day → Teachers look tired, not necessarily bored
  - Sleeping? Not asleep, but dozing (same person twice)
- Reading Video Worksheet during DVD
- Still focused for Scene 5
- Focused, but slightly less so for Scene 6
- Principal has heard of CAS, usually doesn't get back to the teachers
- One teacher doesn't like TeacherTube
- Asking questions about video survey
- People were taking notes more than once
- Lots of looking down at the video worksheet
- **Question:** What is the purpose of this meeting?
  - Dual purpose- Introduction to CAS; Help improve PD materials
- Possibly more time necessary for video worksheet

- Looking around
- Talking → quick comments to each other
- Looking at the provided CAS materials → seem to be interested

Comments:

- Like manipulating the data → e.g. mean
  - Never considered that before
  - "There's a difference between seeing and understanding"
- Helps in critical point where students start to learn that data can be manipulated
- Sparks ideas
- Can even show PD to students?
  - Teachers learn first, then they can show students specific data
- One teacher doesn't think it will be appropriate for 5 and 6 year olds → discussing having young students collect their own data, e.g. measure belly button height

Biggest Problem as we see it → LACK OF ADVERTISING
Principals see CAS, but it never actually reaches teachers!

St. Mary Magdalen's School- 22 April 2009
Heard of CAS? 0/2

<u>Behavioral Descriptions</u>
Confusion/Frustration
- ❐ Furrowed brow
- ❐ Loss of focus or not paying attention
- ❐ Sighing and other abnormal, discouraging sounds
- ❐ Deep Breaths
- ❐ Constantly glancing over at others instead of own computer screen
- ❐ Changing bodily orientation e.g. Shifting from left to right
- ❐ Placing hands on head
- ❐ Having trouble finishing individual tutorials on time
- ❐ Asking a large amount of questions at the end of a particular tutorial section
- ❐ Other: _____

Boredom
- ❐ Loss of focus or not paying attention
- ❐ Distracted by other people/things in the room
- ❐ Checking the Time
- ❐ Doing other tasks on the computer
- ❐ Text Messaging
- ❐ Other: _____

Positive Reactions
- ❐ Nodding
- ❐ Smiling
- ❐ Intense Focus
- ❐ Absorbed in Program ******
- ❐ Other: __Very intrigued_____

Notes:
- Seem to be interested
- Focused through all three scenes (4, 6, 7)
- Chatting during video worksheet
- Arms crossed, looks slightly bored, but also pensive
- Didn't know about CountIf Function → laughed
- "Is it all to do with Excel?"
  - ○ Yes, this DVD focuses on Excel → useful tool with statistics
    - ▪ "Oh that's good!"
- Laughing and Smiling "Imagine the debate…"
- "Hmmm"
- Laughing at removing outliers from the scatter plot
- Copying a formula down a set of data → "Hmmm"

- VERY INTERESTED
- "I thought it was geared toward secondary schools"
- Didn't know about TeacherTube

Huntingtower School- 23 April 2009
Heard of CAS? 1/8
2 Primary Teachers (Years 5&6); 6 Secondary
<u>Behavioral Descriptions</u>
Confusion/Frustration
- ❒ Furrowed brow
- ❒ Loss of focus or not paying attention
- ❒ Sighing and other abnormal, discouraging sounds
- ❒ Deep Breaths
- ❒ Constantly glancing over at others instead of own computer screen
- ❒ Changing bodily orientation e.g. Shifting from left to right
- ❒ Placing hands on head
- ❒ Having trouble finishing individual tutorials on time
- ❒ Asking a large amount of questions at the end of a particular tutorial section
- ❒ Other: _____

Boredom
- ❒ Loss of focus or not paying attention
- ❒ Distracted by other people/things in the room- Other computers
- ❒ Checking the Time
- ❒ Doing other tasks on the computer
- ❒ Text Messaging
- ❒ Other: __Either Doodling, or taking EXTREME amounts of notes_____

Positive Reactions
- ❒ Nodding **X2**
- ❒ Smiling**/ Laughing**
- ❒ Intense Focus
- ❒ Absorbed in Program
- ❒ Other: __**Taking lots of notes** _____

Notes:

- Scene 4: Very focused
- Scene 6: Still focused → Questions/Comments
- Scene 7: Somewhat less focused → People need to leave early; they're filling out the concluding survey early
- More discussion instead of watching/listening
- Question on "Teaching Degrees" Question
- Good focus at beginning
- Have computers in front of them → somewhat distracted
- "Do I go to the website to get the data?"
    - o Arie explained process
- "Can my students be part of the data?"
    - o Liya explained

- o 2008- 44,000 students completed questionnaire
  - o 2006- 112,000 students completed questionnaire
  - o In 2010 the questionnaire will reopen; will become an annual process
- "Is all the data just the datat that schools have added? Or does it include data from the census?"
  - o Just from schools
- Food somewhat distracting
- Don't need to double click to type in Excel → Seem familiar with Excel
- **They're analyzing the Excel techniques presented in DVD; Noting that there are better ways to do things in Excel**
- Agree that Excel is very useful
- Talking to each other/commenting
- **Discussing Excel techniques**
- Noticed scale before DVD even talked about it
- "Hmmm" several times
- Math Coordinator looks amused
- Ones teacher doesn't like the new version of Excel and therefore doesn't use it
  - o ***They have MS Excel 2007 at this school**
- Chatting → Nothing not really listening
- "Ian's voice is painful"
- "Does it worry you that they still use 2003?"
- Mentioned using Excel on Macs
- GOOD DISCUSSION
- Seem to be familiar with the Golden Ratio
- Laughing at data → Scene 7: Belly Button Height
- "Need a much bigger graph to make students see things"
- "Graph heading is too big"
- Seem to be engaging in good discussion; talking about different data
- "Cleared trend once outliers were removed"
  - o "There's your golden ratio!"
- Teachers have a good sense of statistics in general

Discussion:

- When using spreadsheets, you only need to see things once
- Need new upgrades for Excel
- "Make sure to get everything right before making the graph so you don't have to go back and fix things"
- Doing tasks such as making borders more than once is unnecessary
- ***Really interested in calculators**
- Like the idea of multiple levels for experienced teachers
- Opportunity to actually DO the tutorials instead of just watching

- Would have liked to see the website
- Interested in upgrades

1. In what age range do you belong?

0-18   19-25   26-35   36-45   46-55   56-65   66+

2. What year(s) do you teach?

☐ 1	☐ 5	☐ 9
☐ 2	☐ 6	☐ 10
☐ 3	☐ 7	☐ 11
☐ 4	☐ 8	☐ 12

3. What subject(s) do you teach?

☐ Primary Mathematics   ☐ English   ☐

☐ History   ☐ Geography   ☐ Other

☐ Science   ☐ ICT

4. What degree(s), other than education, have you majored in (if applicable)?

Bachelor: _____

Post Graduate: _____

5. Check any of the following CensusAtSchool professional development (PD) materials that you have used prior to this session.

☐ DVD

☐ Tutorials on YouTube/TeacherTube

☐ Other CensusAtSchool PD Support Materials

List others: _____

6. What ways do you usually hear about PD resources?

☐ Co-workers

☐ Online (e.g. edna, Facebook, edHelper, Learning Environment)

List sites: _____

☐ E-Mail

☐ Print Media

☐ Other

List others: _____

7. **Check all methods of delivery of PD resources that you feel most comfortable using?**

Online   DVD   Face-To-Face   Print   Other

If other, please specify.
───

8. **Have you ever participated in a workshop with the Australian Bureau of Statistics? If so when?**

Yes   No

Date(s) of participation (DD/MM/YY):   _____

9. **Have you ever used CensusAtSchool in your classroom?**

Yes   No

If yes, then rate your level of confidence/comfort in applying the program in your classroom.

1   2   3   4   5   6   7   8   9   10
Not Comfortable   Very Comfortable

10. **Please rate your comfort of using statistics in the classroom.**

1   2   3   4   5   6   7   8   9   10
Not Comfortable   Very Comfortable

11. **How often do you use Microsoft Excel in your classroom?**

Every Day   Few Times a Week   Once a Week   Few Times a Month
Never

If never, please state reason.
_____

12. **Rate your level of experience using Microsoft Excel.**

Beginner   Intermediate   Advanced

13. Do you have access to a DVD player in your classroom?

Yes   No

14. How often do you use information sharing websites such as YouTube and TeacherTube in your classroom?

Every Day   Few Times a Week   Once a Week   Few Times a Month
Never

If never, please state reason.
_____

INFORMED CONSENT AGREEMENT
FOR PARTICIPATION IN EFFICACY STUDY

Investigators: Corinna Ellis, Maura Craig, Arie Vilders
Title: The Efficacy of the CensusAtSchool Professional Development Materials from the Australian Bureau of Statistics
Sponsor: The Australian Bureau of Statistics Education Services Unit and Worcester Polytechnic Institute (Worcester, Massachusetts, USA)
Contact Information: education@abs.gov.au

Introduction:
You are being asked to participate in a study of the efficacy of professional development materials. Before you agree however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks, or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of Study:
The purpose of this study is to evaluate the efficacy of web-based and DVD professional development resources of the CensusAtSchool program. We will evaluate the content of the tutorials, their delivery method, and the needs of teachers in Australia.

Procedures to be followed:
The study should take approximately 60 minutes. You will be given instructions to watch certain professional development videos through the use of TeacherTube. Afterwards, you will be asked to share your opinions, problems faced, and suggestions regarding the professional development materials via an electronic survey.

Risks to Study Participants:
There are no risks involved with this analysis of professional development materials.

Benefits to Research Participants:
The benefits of this study include improving your awareness of CensusAtSchool including Microsoft Excel and general statistical knowledge. This may also count towards any required professional development hours you may need to complete.

Record Keeping and Confidentiality:
For your confidentiality, names will not be presented within our final report. Any comments you make during this session will be recorded but will be presented in an anonymous manner. The Australian Bureau of Statistics and the investigators will have access to the records of this survey. Upon completion of the report, all materials related to this study will be stored in the secure database of the Australian Bureau of Statistics. Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee, and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB)

will be able to inspect and have access to confidential data that has identified you by name. Any publication or presentation of the data will not identify you.

Compensation of Treatment in the Event of Injury:
You do not forfeit any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in the case of research related injury, contact:

WPI IRB Chair: **University Compliance Officer:**
Professor Kent Rissmiller   Mr. Michael J. Curley
TEL: +01 (508) 831-5019   TEL: +01 (508) 831-6919
E-MAIL: kjr@wpi.edu   E-MAIL: mjcurley@wpi.edu

Project Advisors:
Robert Kinicki   Stephen Weininger
TEL: (04) 0383-0434   TEL: (04) 3284-4923
E-MAIL: rek@wpi.edu   E-MAIL: stevejw@wpi.edu

Your participation in this Study is Voluntary:
Your refusal to participate in this study will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty. The project investigators retain the right to cancel or postpone the experimental procedures as they see fit.

Signing:
By typing your name below you are signing that you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Study Participant Signature: _____

Date (DD/MM/YY): _____

| Approved by WPI IRB |
| From: 02/25/2009 |
| To: 02/24/2011 |

Directions: Please fill out the form to the best of your ability after watching each section of the tutorials.

SCENE 4: THE RANDOM SAMPLER AND SAMPLES
1) **What is your reaction to the pace of the material?**

   Too Fast   Too Slow   Just Right

2) **Please note your initial reactions to this section.**

3) **How would you rate your understanding of how to obtain data through the Random Sampler?**

   None At All   Very Little   Adequate   Excellent

SCENE 5: SIMPLIFY THE DATA
1) **What is your reaction to the pace of the material?**

   Too Fast   Too Slow   Just Right

2) **Please note your initial reactions to this section.**

3) **Check all topics on which you had knowledge prior to viewing the tutorial.**

   ☐   Creating Multiple Worksheets in a Workbook
   ☐   Copying and Pasting Data from One Worksheet to Another

SCENE 6: WORKING WITH THE DATA
1) **What is your reaction to the pace of the material?**

   Too Fast   Too Slow   Just Right

2) **Please note your initial reactions to this section.**

3) **Check all topics on which you had knowledge prior to viewing the tutorial.**

   ☐   Creating a Summary Table in Microsoft Excel
   ☐   Using the COUNTIF Function
   ☐   Creating and Editing a Graph in Microsoft Excel
   ☐   Using the Sort Function in Microsoft Excel

☐ Using the Mean and Median Function in Microsoft Excel

SCENE 7: USING CENSUSATSCHOOL IN THE CLASSROOM

1) What is your reaction to the pace of the material?

Too Fast   Too Slow   Just Right

2) Please note your initial reactions to this section.

3) Do you understand the applications of the CensusAtSchool program?

Yes   No

If not, please explain your reasoning.

Appendix I: Concluding Survey

Please answer the following questions to the best of your ability.

1. **How helpful do you feel the online tutorials were?**

   Very   Somewhat   Not At All

2. **What chapter from the online tutorials did you find the most useful?**

   ☐ The Random Sampler and Samples
   ☐ Simplify the Data
   ☐ Working with the Data
   ☐ Using CensusAtSchool in the Classroom

   Please explain your reasoning.

3. **What chapter from the online tutorials did you find the least useful?**

   ☐ The Random Sampler and Samples
   ☐ Simplify the Data
   ☐ Working with the Data
   ☐ Using CensusAtSchool in the Classroom

   Please explain your reasoning.

4. **What styles do you like when viewing a professional development resource?**

   ☐ Being able to see the narrators as they are talking
   ☐ Having a bulleted list summarizing what is being said
   ☐ Watching the step-by-step process of the actions being done
   ☐ Other
           List others: _____

5. **Is being able to watch the step-by-step process helpful or do you find it repetitive? Please explain your reasoning.**

6. **Rate your level of confidence/comfort in applying CensusAtSchool in your classroom AFTER viewing the online tutorials.**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Not Comfortable   Very Comfortable

7. **How helpful were the tutorials in enhancing your Microsoft Excel skills?**

Very   Somewhat   Not At All

8. **What can be done to make the PD materials more useful for you?**

9. **What information is missing from the online tutorials that you would like to see?**

10. **Do you think you will use CensusAtSchool materials in your classroom?**

Yes   Maybe   No

Please explain your reasoning.

Question 1	
Primary	
0-18	0
19-25	0
26-35	9
36-45	2
46-55	1
56-65	1
66+	0
Secondary	
0-18	0
19-25	1
26-35	0
36-45	3
46-55	4
56-65	0
66+	0

Question 2	
Primary	
Prep	2
1	2
2	2
3	3
4	4
5	7
6	6
Secondary	
7	2
8	3
9	4
10	6
11	4
12	4

Question 3	
Primary	
Primary	14
History	0
Science	0
English	0
Geography	0
ICT	0
Mathematics	0
Physical Education	1
Non-Teaching Principal	1
Secondary	
Primary	0
History	0
Science	0
English	0
Geography	0
ICT	0
Mathematics	6
Physical Education	0
Non-Teaching Principal	0

Question 4	
Primary	
Bachelor:	Post Graduate:
Arts (History)	Public Policy
Information Systems	Education Wellbeing
Arts and Education	Primary Education
Arts-majored in Psychology	Arts and Education
Arts-Literature major	Literacy Intervention (part masters)
Arts	Special Needs
Teaching/bachelor of education	Early Intervention Literacy
Biomedical Science	Mathematics
Education	Diploma in Education
Education (Primary)	Masters of Education
Bachelor of Arts	
Education	
Secondary	
Mathematics/Secondary Education	I.T.
Bachelor of Education (Secondary)	Maths Education
Mathematics	
Chemical Engineering	
Education	
Science	

Question 5	
Primary	
DVD	2
Tutorials on YouTube/TeacherTube	0
Other CAS PD Support Materials	1
Secondary	
DVD	0
Tutorials on YouTube/TeacherTube	0
Other CAS PD Support Materials	0

Question 6	
Primary	
Co-Workers	16
Online	7
E-Mail	11
Print Media	8
Other:	4
Catholic Education Site	
MyClasses Portal	
Maths Conferences	
Secondary	
Co-Workers	4
Online	1
E-Mail	3
Print Media	3
Other:	
Maths Conferences	

Question 7	
Primary	
Online	14
DVD	13
Face-to-Face	16
Print	10
Other	
Secondary	
Online	3
DVD	3
Face-to-Face	5
Print	3
Other	

Question 8	
Primary	
Yes	1
No	15
2006 December at a Conference	
Secondary	
Yes	1
No	5
At annual MAV conference	

Question 9	
Primary	
Yes	2
No	14
Comfort Level:	
1	0
2	0
3	0
4	1
5	0
6	0
7	0
8	0
9	1
10	0
Secondary	
Yes	1
No	5
Comfort Level:	
1	0
2	0
3	0
4	0
5	1
6	0
7	0
8	0
9	0
10	0

Question 10	
Primary	
1	0
2	0
3	0
4	2
5	4
6	1
7	4
8	2
9	
10	1
Secondary	
1	0
2	0
3	0
4	0
5	0
6	1
7	1
8	1
9	2
10	1

Question 11	
Primary	
Every Day	0
Few Times a Week	0
Once a Week	0
Few Times a Month	6
Never	7
"I don't know how"	
"It's not often as my own skills set is weak"	
"Thought it too complex for children"	
"few times per year"	
"one unit in the year"	
Secondary	
Every Day	0
Few Times a Week	1
Once a Week	0
Few Times a Month	3
Never	2
"not applicable to the maths that I teach"	
"I usually use the CAS calculator or graphics calculator"	

Question 12	
Primary	
Beginner	10
Intermediate	5
Advanced	2
Secondary	
Beginner	1
Intermediate	4
Advanced	2

Question 13	
Primary	
	1
Yes	3
No	1
Secondary	
Yes	3
No	1
Sometimes	3

Question 14	
Primary	
Every Day	
Few Times a Week	3
Once a Week	4
Few Times a Month	3
Never	7
"Youtube is blocked/banned. Never heard of teachertube"	
"time is needed to find appropriate material"	
"time required to locate relevant and appropriate material"	
Secondary	
Every Day	
Few Times a Week	
Once a Week	
Few Times a Month	1
Never	5
"Infamiliar territory"	
"haven't had the chance to see its use in senior (non-statistics) classes"	
"have not had much introduction to it"	
"never investigated the likelihood"	

Appendix K: Compiled Raw Data – Video Survey

Scene 4:

Question 1	
Primary	
Too Fast	5
Too Slow	0
Just Right	11
Secondary	
Too Fast	0
Too Slow	0
Just Right	6

Question 2
Primary
"Too much information for beginners"
Need opportunity to practice on computer"
"Too many screen changes"
"Very quick in between screena and not enough written instructions"
"Needs a window to check information, perhaps a summary with a tick box"
"Understood data okay, just went at the right pace"
"Too much info all at once"
"I wondered what "random sample" was and some idea of why students would use it"
"Not visually interesting"
"Obviously I would need to rewatch it and do it slowly to learn the application"
"Very clear instructions and easy to understand"
"Very clear information and easy to understand"
"Confusing"
"To be honest, I thought the lady's accent was a little broad-is that relevant?"
"It was a bit dry. It that useful? I did zone out"
"I'm glad they explained the terms"
"Need to show the questionnaire for people who have not seen it before a number of times to make sense."
"Was unsure of where the data came from because I had not done this PD or used this before"
"Would need more time to actually work through the process"
"I would need to take notes to recall all the steps"
Secondary
"Very straight and to the point"
"It was very easy to follow and understand"
"Straight forward-great connections between verbal and pictoral ideas"

Question 3	
Primary	
None at All	0
Very Little	6
Adequate	12
Excellent	0
Secondary	
None at All	0
Very Little	0
Adequate	5
Excellent	1

Scene 5:

Question 1	
Primary	
Too Fast	1
Too Slow	0
Just Right	11

Question 2
Primary
pretty straight forward
step by step instructions
needs a summary page
I'd need to have had a go on the computer before moving on to the next stage if I was learning how to use it
Interested
thought it was confusing at first and I would need extra coaching but after the third example I got the hang of it!
quite confusing
fine, it was worthwile having the demonstration of how two past two nonconsecutive columns-I missed it the first time
again, need to view at your own pace
it's good that it is step by step instructions and even better that we can see how its done
that I alredy had an understanding of copying and pasting data from one worksheet to the next

Question 3	
Primary	
Creating Multiple Worksheets in a Workbook	6
Copying and Pasting Data from One Worksheet to Another	11

Scene 6:

Question 1	
Primary	
Too Fast	5
Too Slow	1
Just Right	10
Secondary	
Too Fast	0
Too Slow	3
Just Right	2

Question 2
Primary
"too much info all at once"
"too long, needs to be shorter and sharper"
"totally lost!"
"very informative"
"already had prior knowledge of these functions"
"good-interesting"
"useful"
"great information on using excel in the classroom-clear"
"learnt some useful functions for excelt that are pretty easy to use"
"a lot of information"
"good examples"
"that is was interesting to see how easy it is to use in the classroom. It also triggered my memory on some aspects of using excel"
"I would have three separate units for this-a lot to take in in one session for beginners"
"A lot of information to take in. I would need to watch it several times"
Secondary
"old excel"
"too many basic steps explained in detail"
"I felt that this was a tutorial for Excel, not for CensusAtSchool"
"use of mouse on excel sheet incorrect"
"male voice-a bit painful-not of a presentor but of a man discussing a spreadsheet"

Question 3	
Primary	
Creating a Summary Table in Microsoft Excel	7
Using the COUNTIF function	4
Creating and Editing a Graph in Microsoft Excel	12
Using the Sort Function in Microsoft Excel	10
Using the Mean and Median Function in Microsoft Excel	6
Secondary	
Creating a Summary Table in Microsoft Excel	5
Using the COUNTIF function	1
Creating and Editing a Graph in Microsoft Excel	4
Using the Sort Function in Microsoft Excel	3
Using the Mean and Median Function in Microsoft Excel	5

Scene 7:

Question 1	
Primary	
Too Fast	1
Too Slow	0
Just Right	1
Secondary	
Too Fast	0
Too Slow	1
Just Right	2

Question 2
Primary
"I think this part about finding ratios would be quite difficult for most year 5/6 students. Lots of new infomration to learn in this section. Would require quite a bit of practice myself to get my head around some of the new applications."
"great information however may be a little advanced for primary-an alternative video geared at primary would be great"
Secondary
"This was an excel tutorial, not a CensusAtSchool tutorial"
"too slow"
"need to know what the golden ratio value is"

Question 3	
Primary	
Yes	2
No	0
"most of it"	
Secondary	
Yes	4
No	0

Appendix L: Compiled Raw Data – Concluding Survey

Question 1	
Primary	
Very	10
Somewhat	6
Not at All	1
Secondary	
Very	1
Somewhat	5
Not at All	0

Question 2	
Primary	
The Random Sampler and Samples	4
Simplify the Data	6
Working with the Data	11
Using CensusAtSchool in the Classroom	2
Explain:	
"needed a brush up on some of this as I had forgotten some of it"	
"because I will be studying again this year it will be very helpful for me at this stage"	
"useful Excel applications and shows how we can use real life infomration in mathematics"	
"it provided a simple scaffold on how to use excel in the classroom"	
"all relevant"	
"I'm not confident using the functions in excel"	
Secondary	
The Random Sampler and Samples	3
Simplify the Data	0
Working with the Data	0
Using CensusAtSchool in the Classroom	3
Explain:	
"using CAS had practical application which is useful, can extend our own ideas"	
"I would have liked to see more of the CensusAtSchool website, rather than Excel tutorials"	
"it was the only piece of info I received"	

Question 3	
Primary	
The Random Sampler and Samples	5
Simplify the Data	2
Working with the Data	1
Using CensusAtSchool in the Classroom	2
Explain:	
"Random sampler was the least interesting of the material. I was trying to relate it to my Year 2 classroom"	
"random sampler was not necessary"	
"working with the data was too lng and too much to remember"	
"I already had a pretty strong understanding of simplify the data"	
"Not sure if it was me or the random sampler tutorial but I zoned out entirely."	
Secondary	
The Random Sampler and Samples	1
Simplify the Data	0
Working with the Data	3
Using CensusAtSchool in the Classroom	0
Explain:	
"much of the presentation involved viewing examples/instructions that I already knew about"	
"Working with the data just explained how to use Excel, which I already knew how to do"	
"working with the data was slow/out of date of even just incorrect mouse usage"	

Question 4	
Primary	
Being Able to see the narrators as they were talking	4
Having a bulleted list summarazing what is being said	8
Watching the step-by-step process of the actions being done	15
List Others:	
check-lists and guide reviews	
finished products	
repetition	
interative-learning and doing it at the same time	
hands on/doing while watching	
it would be helpful being able to print off a hand copy summary of the steps required	
Secondary	
Being Able to see the narrators as they were talking	1
Having a bulleted list summarazing what is being said	3
Watching the step-by-step process of the actions being done	6
List Others:	
having a chance to do things for myself	

Question 5
it was helpful although I'm not sure how I'd apply the information
helpful because it is broken down and easier to remember
helpful if you are able to practice the skills alongside this
helpful as repetition reinforces understanding for me
it is helpful-not necessary to repeat the same process, only if repetition leads to different outcomes
very helpful-helps me to understand how we arrived at a finished product
helpful-chance to cement videos/understanding
I prefer the visual
being able to watchi it is very useful
very helpful-if time permitted would be good to do a simple one yourself as the video is going
helpful-just needs to pause here and there
helpful
I enjoy watching and then applying what I have learned
it is helpful. I like to see how it is done and to know where to find all the functions.
I need a lot of repetition to grasp the process
sometimes repetative
you can see the menus and where to find them
I liked the step-by-step process on the scene 4 video because it introduced the CensusAtSchool program visually
I was not always necessary to repeat similar steps that were covered before
helpful but more detail needed
initial helpful but if repeated in next video was a waste of time.

Question 6	
Primary	
1	1
2	1
3	
4	1
5	2
6	3
7	2
8	1
9	
10	3
Secondary	
1	
2	
1	
2	
3	
4	
5	
6	1
7	2
8	1
9	1
10	1

Question 7	
Primary	
Very	4
Somewhat	12
Not At All	
Secondary	
Very	1
Somewhat	3
Not At All	2

Question 8
Primary
slower pace in scene 6
examples of use with primary classroom
to show how it applies to each classroom
to show more examples of how to use it lesson-wise
working on a computer and putting knowledge into practice
reduce the length-no need to show the speaker
need time to have hands on
most people learn on a need to know basis
a few more examples of different ways we can use the different data. Otherwise, it's very good.
nothing, I have litle knowledge in excel
Specialy geared to upper primary classroom-they should cover the VELS
more examples and update the excel version
make the material accessible for use on data projector for students to use as a tutorial
Secondary
This was helpful mainly because I was out of practice
allowing for the opportunity to do things for ourselves-different teacher levels
more hands on tasks
Once we check out the teacher area on the website we'll have more of an idea of what is availible
more real, school based application

Question 9
Primary
Reaction of Children to this data
Examples of how this is used within lessons
how it is used in school with a real purpose (not just eye colour etc) as in a real life situation
all the types of data that we can access from the Census. Or more examples
other samples of what the Census questions were and how they would be used.
it wasn't info missing but the quantity of into that was somewhat daunting
Secondary
I could see using these on the data projector for the whole class in a computer lab situation

Question 10	
Primary	
Yes	10
Maybe	3
No	3
Secondary	
Yes	4
Maybe	2
No	0

E-Survey Questions

BACKGROUND:
Please answer the following questions to the best of your ability and then complete the consent form at the end of this document. Questions can be answered by clicking on the grey check boxes (☐), clicking on the grey typing boxes (   ), or by clicking on the grey drop down boxes and selecting an option (Choose one of the following**).**

15. In what age range do you belong?

    Choose one of the following

16. What year(s) do you teach?

☐	1	☐	5	☐	9
☐	2	☐	6	☐	10
☐	3	☐	7	☐	11
☐	4	☐	8	☐	12

17. What subject(s) do you teach?

☐	Primary	☐	English	☐	Mathematics
☐	History	☐	Geography	☐	Other
☐	Science	☐	ICT		

18. What degree(s), other than education, did you major in (if applicable)?

    Bachelor:
    Post Graduate:

19. Check any of the following CensusAtSchool professional development (PD) materials that you have used prior to this session.

☐	DVD
☐	Tutorials on YouTube/TeacherTube
☐	Other CensusAtSchool PD Support Materials
	List others:

20. What ways do you usually hear about PD resources?

☐ Co-workers
☐ Online (e.g. edna, Facebook, edHelper, Learning Environment)
    List sites:
☐ E-Mail
☐ Print Media
☐ Other
    List others:

21. Which method of delivery of PD resources do you feel most comfortable using?

Choose one of the following

   If other, please specify.

22. Have you ever participated in a workshop with the Australian Bureau of Statistics? If so when?

Choose one of the following

Date(s) of participation (DD/MM/YY):

23. Have you ever used CensusAtSchool in your classroom?

Choose one of the following

If yes, then rate your level of confidence/comfort in applying the program in your classroom.

Choose one of the following

24. Please rate your level of statistical confidence.

Choose one of the following

25. How often do you use Microsoft Excel in your classroom?

Choose one of the following

   If never, please state reason.

26. Rate your level of experience using Microsoft Excel.

    Choose one of the following

27. Do you have access to a DVD player in your classroom?

    Choose one of the following

28. How often do you use information sharing websites such as YouTube and TeacherTube in your classroom?

    Choose one of the following

       If never, please state reason.

VIDEO TUTORIALS:

Directions: Please watch the video tutorials and complete the questions following each to the best of your ability. The TeacherTube links are located at the end of the email and are numbered to correspond to particular questions.

THE RANDOM SAMPLER AND SAMPLES

Please watch video tutorial 1 and answer the following questions.

1. What is your reaction to the pace of the material?

    Choose one of the following

2. Note your initial reactions to this section.

3. How would you rate your understanding of how to obtain data through the Random Sampler?

    Choose one of the following

SIMPLIFY THE DATA

Please watch video tutorial 2 and answer the following questions.

1. What is your reaction to the pace of the material?

    Choose one of the following

2. Note your initial reactions to this section.

3. Check all topics on which you had knowledge prior to viewing the tutorial.

☐   Creating Multiple Worksheets in a Workbook
☐   Copying and Pasting Data from One Worksheet to Another

<u>WORKING WITH THE DATA</u>
Please watch video tutorials 3, 4, and 5 and answer the following questions.
1. What is your reaction to the pace of the material?

   Choose one of the following

2. Is being able to watch the step-by-step process helpful or do you find it repetitive? Please explain your reasoning.

Please watch video tutorials 6 and 7 and answer the following questions.
3. What is your reaction to the pace of the material?

   Choose one of the following

4. Note your initial reactions to this section.

5. What styles do you like when viewing a professional development resource?

☐   Being able to see the narrators as they are talking
☐   Having a bulleted list summarizing what is being said
☐   Watching the step-by-step process of the actions being done
☐   Other
          List others:

6. Check all topics on which you had knowledge prior to viewing the tutorial.

☐   Creating a Summary Table in Microsoft Excel
☐   Using the COUNTIF Function
☐   Creating and Editing a Graph in Microsoft Excel
☐   Using the Sort Function in Microsoft Excel
☐   Using the Mean and Median Function in Microsoft Excel

Completing this last tutorial is completely optional. Your responses and views on the tutorial would be greatly appreciated, but in order to keep the survey as short as possible it is being left optional.
If you would like to skip this last tutorial then please continue on to the conclusion section.

Please watch video tutorial 8 and answer the following questions.

1. What is your reaction to the pace of the material?

   Choose one of the following

2. Note your initial reactions to this section.

3. Do you understand the applications of the CensusAtSchool program?

   Choose one of the following

   If not, please explain your reasoning.

CONCLUSION:
Please answer the following questions to the best of your ability.

11. How helpful do you feel the online tutorials were?

    Choose one of the following

12. What chapter from the online tutorials did you find the most useful?

    Choose one of the following

    Please explain your reasoning.

13. What chapter from the online tutorials did you find the least useful?

    Choose one of the following

    Please explain your reasoning.

14. Rate your level of confidence/comfort in applying CensusAtSchool in your classroom AFTER viewing the online tutorials.

    Choose one of the following

15. How helpful were the tutorials in enhancing your Microsoft Excel skills?

Choose one of the following

16. What can be done to make the PD materials more useful for you?

17. What information is missing from the online tutorials that you would like to see?

18. Do you think you will use CensusAtSchool materials in your classroom?

Choose one of the following

Please explain your reasoning.

Please read the following document of consent in its entirety before retuning this survey.

INFORMED CONSENT AGREEMENT
FOR PARTICIPATION IN EFFICACY STUDY

Investigators: Corinna Ellis, Maura Craig, Arie Vilders
Title: The Efficacy of the CensusAtSchool Professional Development Materials from the Australian Bureau of Statistics
Sponsor: The Australian Bureau of Statistics Education Services Unit and Worcester Polytechnic Institute (Worcester, Massachusetts, USA)
Contact Information: education@abs.gov.au

Introduction:
You are being asked to participate in a study of the efficacy of professional development materials. Before you agree however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks, or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation.

Purpose of Study:
The purpose of this study is to evaluate the efficacy of web-based and DVD professional development resources of the CensusAtSchool program. We will evaluate the content of the tutorials, their delivery method, and the needs of teachers in Australia.

Procedures to be followed:
The study should take approximately 25 minutes. You will be given instructions to watch certain professional development videos through the use of TeacherTube. Afterwards, you will be asked to share your opinions, problems faced, and suggestions regarding the professional development materials via an electronic survey.

Risks to Study Participants:
There are no risks involved with this analysis of professional development materials.

Benefits to Research Participants:
The benefits of this study include improving your awareness of CensusAtSchool including Microsoft Excel and general statistical knowledge. This may also count towards any required professional development hours you may need to complete.

Record Keeping and Confidentiality:
For your confidentiality, names will not be presented within our final report. Any comments you make during this session will be recorded but will be presented in an anonymous manner. The Australian Bureau of Statistics and the investigators will have access to the records of this survey. Upon completion of the report, all materials related to this study will be stored in the secure database of the Australian Bureau of Statistics. Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee, and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that has identified you by name. Any publication or presentation of the data will not identify you.

Compensation of Treatment in the Event of Injury:
You do not forfeit any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in the case of research related injury, contact:

WPI IRB Chair: **University Compliance Officer:**
Professor Kent Rissmiller   Mr. Michael J. Curley
TEL: +01 (508) 831-5019   TEL: +01 (508) 831-6919
E-MAIL: kjr@wpi.edu   E-MAIL: mjcurley@wpi.edu

Project Advisors:
Robert Kinicki   Stephen Weininger
TEL: (04) 0383-0434   TEL: (04) 3284-4923
E-MAIL: rek@wpi.edu   E-MAIL: stevejw@wpi.edu

Your participation in this Study is Voluntary:
Your refusal to participate in this study will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty. The project investigators retain the right to cancel or postpone the experimental procedures as they see fit.

Signing:

By typing your name below you are signing that you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Study Participant Signature: _____

Date (DD/MM/YY): _____

```
┌─────────────────────────────┐
│     Approved by WPI IRB     │
│    From:  02/25/2009        │
│     To:  02/24/2011         │
└─────────────────────────────┘
```

Thank you for taking your time to help us with our study. Please save this document as a file on your computer, and then attach it to the return email to Arie.Vilders@abs.gov.au. Thanks again, we really appreciate your help.

Appendix N: Instructional E-mail Accompanying Electronic Survey

Hello,

My name is _____, and I work with the Education Services Unit of the Australian Bureau of Statistics. Yesterday my colleague ____ spoke with you in regards to more information about the CensusAtSchool program and the possibility of completing an electronic survey.

Feedback we have received from primary and secondary teachers indicates that they are in need of support materials. We are addressing this need by updating our professional development materials for the CensusAtSchool program in order to make them more effective and useful for teachers. CensusAtSchool is a program that provides a free online learning experience for students which aims to improve mathematical literacy throughout Australia. To learn more about CensusAtSchool, you may visit the program's website at http://www.abs.gov.au/websitedbs/cashome.nsf/Home/Home.

We have designed an online survey and questionnaire which will help us evaluate these materials in order to determine their effectiveness and usefulness for teachers. This is part of Education Services' goal to constantly ensure that we are providing useful resources for teachers as well as students. Participation would require approximately 25 minutes of your time and would include watching a few online professional development tutorials with an accompanying e-survey. Below are the TeacherTube video links for you to watch while completing the attached survey. They are numbered to clarify the order of the videos that correspond to particular survey questions.

You may complete this evaluation on your own time at your convenience. Completed surveys should be e-mailed back to ____.____@abs.gov.au by 31 March. If this date is an inconvenience, then please return this survey by 9 April at the latest. Please include a mailing address with your response in order to receive a free copy of the CD and DVD professional development resources from the Australian Bureau of Statistics. In addition, if you know of any other teachers who may be interested we would be more than happy to receive their feedback as well.

1. http://www.teachertube.com/view_video.php?viewkey=d9b8590dd89d998b46ca
2. http://www.teachertube.com/view_video.php?viewkey=d67250179d9be1a436c0
3. http://www.teachertube.com/view_video.php?viewkey=740268831088a044b30f
4. http://www.teachertube.com/view_video.php?viewkey=87f78f4e5aebc9f053d5
5. http://www.CensusAtSchool.com/view_video.php?viewkey=6ce0099f35285c496052
6. http://www.teachertube.com/view_video.php?viewkey=10a58b4090eba4df58ed
7. http://www.teachertube.com/view_video.php?viewkey=ef5eb1b8cc01e3a2ba69
8. http://www.teachertube.com/view_video.php?viewkey=710790ba541fe52290fb

Warm regards and thank you for your assistance,

_____
Education Services
Australian Bureau of Statistics
Ph: (03) 9615 7505
E-mail: ____._____@abs.gov.au

My name is _____ and I work with the Educational Services Unit of the Australian Bureau of Statistics. I was wondering if I could speak with a professional development coordinator or a deputy principal.

My name is _____ and I work with the Educational Services Unit of the Australian Bureau of Statistics. We are updating our CensusAtSchool Professional Development materials in hope to make them more effective. Are you familiar with CensusAtSchool?

CensusAtSchool provides an online learning experience for students with an aim to raise awareness of the Australian population census. It also helps to improve mathematical literacy for both students and teachers.

Our records have shown that primary and secondary school teachers are in need of better support materials, therefore we are updating our resources. May I have about five minutes of your time to ask you a few questions regarding your experience with professional development?

Part I: General

What years and subjects do you teach?

1   2   3   4   5   6   7   8   9   10   11   12

Primary   English   Mathematics   History   Geography   ICT   Science
Other_____

Do you consider your school to be in a remote location?

How do you usually find out about professional development opportunities?

- School (if so, please give some further explanations _____)
- Co-Workers
- E-Mail
- Online
- Print Media
- Other _____

How many hours of 'official' professional development do you typically complete during the year?

_____ hrs

When it comes to professional development what delivery methods do you prefer most?
- Face – to – face workshop
- Online
- Print
- DVD/CD
- Other? _____

What qualities do you look for in good professional development resources?

Of the following topics, which do you feel needs to be covered more in professional development?
    a. Microsoft Excel
    b. CensusAtSchool
    c. General Statistics
    d. Other _____

Part II: CensusAtSchool

Have you used CensusAtSchool in your classroom?

Have you used any of the CensusAtSchool PD materials prior to this session?
    o DVD
    o Viewed Tutorials on YouTube/TeacherTube
    o Other _____
    o None

Have you ever participated in a workshop with the Australian Bureau of Statistics? If so when?

Appendix P: Cold Calling Data

	Phone Interviews in NT
Yes	49
No	131
Total:	**180**

Primary Schools		
In Contact With:	**86**	**75%**
Focus Groups	4	5%
Electronic Survey	7	8%
Phone Interview	1	1%
No Feedback:	**74**	**86%**
Voicemail	16	22%
Left Phone #	33	44%
Emailed Info	19	26%
Other	2	3%
Not Interested	4	5%
No Contact	**29**	**25%**
TOTAL:	**115**	

Secondary Schools		
In Contact With:	**36**	**78%**
Focus Groups	0	0%
Electronic Survey	3	11%
Phone Interview	1	3%
No Feedback:	**32**	**86%**
Voicemail	15	47%
Left Phone #	6	19%
Emailed Info	6	19%
Other	3	9%
Not Interested	22	**6%**
No Contact	**10**	**22%**
TOTAL:	**46**	