

# Teaching Notes: Community Survey

## Components

- *Application Question: School Issue*
  - To develop Competency 2: Uses mathematical reasoning
  - To develop Competency 3: Communicates by using mathematical language
  - Can be used after completing *Nelson Mathematics Secondary Year Two, Cycle One* Chapter 3
- *Situational Problem: Presenting Your Findings*
  - To develop Competency 1: Solves a situational problem
  - Can be used after completing *Nelson Mathematics Secondary Year Two, Cycle One* Chapter 3

## Broad Areas of Learning: Citizenship and Community Life; Media Literacy

### Educational Aim

- To enable students to use statistics in making rules, improving life in society, at school, or in the classroom
- To enable students to see how surveying and analyzing other people's opinions can improve their understanding of different problems and develop arguments with a view to making an informed decision

### Focus of Development

- To enable students to take part in the life of their school or classroom and to develop an attitude of openness to the world and respect for diversity
- To develop students' ethical and critical judgement by using different types of representations as well as proportional, probabilistic, and statistical reasoning to make comparisons and gauge the difference between the reality of a situation and the way people perceive it

## Cross-Curricular Competencies

- Uses information
- Solves problems
- Uses information and communication technologies
- Communicates appropriately

## Concepts

### Statistics: Statistical Reports

- Population, sample
  - Sample survey, poll, census
  - Representative Sample
  - Sampling methods: simple, random, systematic
- Data
  - Qualitative variable
  - Discrete or continuous quantitative variable
- Table: characteristics, frequencies
- Reading graphs: bar graphs, broken-line graphs, circle graphs

## Processes

### Statistics: Processing Data from Statistical Reports

- Conducting a survey or a census
  - Determining the population or the sample
  - Gathering data
- Organizing and choosing certain tools to present data
  - Constructing tables
  - Constructing graphs: bar graphs, broken-line graphs, circle graphs
  - Highlighting some of the information that can be derived from a table or a graph (e.g. minimum value, maximum value, range, mean)

## Application Question: School Issue

<b>Preparation and Planning</b>	
Pacing	5–10 min Introduction 40–50 min Individual work
Materials	<ul style="list-style-type: none"><li>• grid paper</li><li>• a ruler</li></ul>
Masters	<ul style="list-style-type: none"><li>• School Issue</li></ul>
Can be done after completing	<i>Nelson Mathematics Secondary Cycle One, Year Two Chapter 3</i>

### Introduction (Whole Class) 5–10 min

Discuss with students survey methods and sources of bias. Ask for suggestions on how a survey can be conducted of students in a school so that all groups are fairly represented.

### Using the Application Question (Individual) 40–50 min

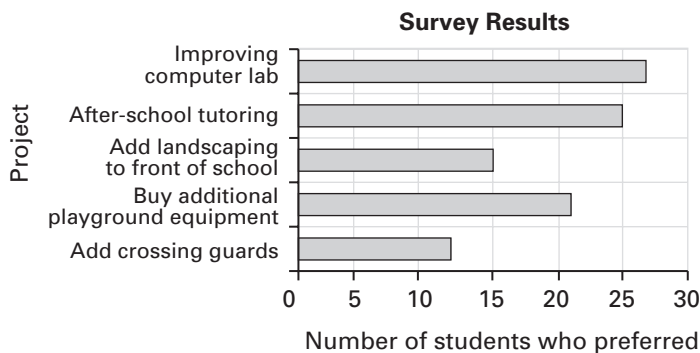
Together, read the introduction, application question, and the description of the survey for School Issue. Allow students to work individually to answer the questions and produce a bar graph from the survey data.

If students are having difficulty...	What you can do to help
Students may have difficulty determining whether there are sources of bias in the survey.	<ul style="list-style-type: none"><li>• Ask students to think about whether the way that the survey was conducted (at the entrance to the school, every sixth person surveyed) is likely to exclude any group or to include a portion of the population that is not representative of the entire population.</li></ul>

### Sample Solution (Thorough)

- A. It does not seem that there are any sources of bias in the survey. The survey was conducted at the entrance to the school, where all students had a chance to be surveyed. Every sixth student entering the school is surveyed, which is not likely to lead to any particular group being unfairly represented, whether underrepresented or overrepresented. The population is all of the students in the school. The sample size is 100, the number of students that were surveyed. Some improvements that could be made to the way that the survey was conducted are to have surveyed more people, to have had more than one person performing the school, or to have conducted the survey in multiple locations. Each of these changes may have produced a more representative sample of the population.

**B.**



Maximum value: 27, Minimum value: 12, Range: 15

**Assessment of Learning: School Issue**

Level	Competency	Overall judgment at end of cycle
5	Advanced	The student's competency <b>exceeds</b> the requirements.
4	Thorough	The student's competency <b>clearly meets</b> the requirements.
3	Acceptable	The student's competency <b>barely meets</b> the requirements.
2	Partial	The student's competency <b>fails to meet</b> the requirements.
1	Minimal	The student's competency <b>clearly fails to meet</b> the requirements.

**Competency 2: Uses mathematical reasoning**

Evaluation criteria for the competency: Uses mathematical reasoning	Observable elements The student...
CR 3– Proper application of mathematical reasoning suited to the situation	<ul style="list-style-type: none"> <li>• is able to identify improvements to be made to the survey method</li> <li>• provides justification for their choice(s)/statement</li> </ul>
CR 2– Correct use of concepts and processes appropriate to the situation	<ul style="list-style-type: none"> <li>• addresses the notion of possible biases</li> <li>• identifies the sample size and population</li> <li>• addresses the notion of a representative sample</li> <li>• identifies the type of sampling method used: simple random sample</li> </ul>
CR 4– Proper organization of the steps in an appropriate procedure shows his/her work in a clear and organized manner	<ul style="list-style-type: none"> <li>• uses the given survey results to produce a correct bar graph</li> <li>• shows his/her work in a clear and organized manner</li> </ul>
CR 5– Correct justification of the steps in an appropriate procedure	<ul style="list-style-type: none"> <li>• makes statements that justify his/her conclusion</li> <li>• uses solid mathematical arguments in explanation of why the sample size and sampling method used were most appropriate</li> </ul>
CR 1– Formulation of a conjecture	

<b>Competency 2: Uses mathematical reasoning</b>					
<b>Evaluation Criteria</b>	<b>Advanced</b>	<b>Thorough</b>	<b>Acceptable</b>	<b>Partial</b>	<b>Minimal</b>
<b>Formulation of a conjecture appropriate to the situation</b>					
<b>Correct use of the concepts and processes appropriate to the situation</b>	<ul style="list-style-type: none"> <li>produced a correct bar graph from the survey data and correctly identified the information that could be determined from the table or the graph</li> </ul>	<ul style="list-style-type: none"> <li>produced a correct bar graph from the survey data but may not have correctly identified some of the information that could be determined from the table or the graph</li> </ul>	<ul style="list-style-type: none"> <li>produced a graph with some incorrect bar lengths or did not completely label the graph; may not have correctly identified the information that could be determined from the table</li> </ul>	<ul style="list-style-type: none"> <li>produced a graph with some correct bar lengths but incorrect labels; did not correctly identify the information that could be determined from the table</li> </ul>	<ul style="list-style-type: none"> <li>produced an incorrect, unlabelled bar graph and did not correctly identify the information that could be determined from the table</li> </ul>
<b>Proper application of mathematical reasoning suited to the situation</b>	<ul style="list-style-type: none"> <li>answered all questions with clear, complete, well-reasoned responses</li> </ul>	<ul style="list-style-type: none"> <li>answered questions with clear, well-reasoned responses</li> </ul>	<ul style="list-style-type: none"> <li>answered some of the questions with well-reasoned responses</li> </ul>	<ul style="list-style-type: none"> <li>answered a few questions with unclear, incomplete responses and others with some clarity</li> </ul>	<ul style="list-style-type: none"> <li>answered all questions with unclear, incomplete responses</li> </ul>
<b>Proper organization of the steps in an appropriate procedure</b>	<ul style="list-style-type: none"> <li>used the given survey results to produce a correct bar graph and then highlight all of the information that can be determined from the table or graph</li> </ul>	<ul style="list-style-type: none"> <li>used the given survey results to produce a mostly correct bar graph and then highlight most of the information that can be determined from the table or graph</li> </ul>	<ul style="list-style-type: none"> <li>used the given survey results to produce a bar graph and then highlight some of the information that can be determined from the table or graph</li> </ul>	<ul style="list-style-type: none"> <li>used the given survey results to produce a bar graph</li> </ul>	<ul style="list-style-type: none"> <li>did not use the given survey results to produce a bar graph and did not highlight the information that can be determined from the table</li> </ul>
<b>Correct justification of the steps in an appropriate procedure</b>	<ul style="list-style-type: none"> <li>uses solid mathematical arguments in explanation of why the sample size and sampling method used were most appropriate</li> </ul>	<ul style="list-style-type: none"> <li>explanation contains details referring to population, sample size, and sampling method in explaining why the sample size and sampling method used were appropriate based on knowledge of these terms</li> </ul>	<ul style="list-style-type: none"> <li>explanation includes why the sample size and sampling method used were appropriate based on a rudimentary knowledge of these terms</li> </ul>	<ul style="list-style-type: none"> <li>explanation lacks specific details but the justification of the appropriateness of the sample size and sampling method makes sense</li> </ul>	<ul style="list-style-type: none"> <li>explanation does not contain appropriate justification of the appropriateness of the sample size or sampling method</li> </ul>

### Competency 3: Communicates using mathematical language

<b>Evaluation criteria for the competency: Communicates by using mathematical language</b>	<b>Observable elements The student...</b>
CR 1– Correct interpretation of a message involving at least one type of mathematical representation suited to the situation	<ul style="list-style-type: none"> <li>• recognizes the purpose of the message</li> <li>• identifies a graph that is valid to represent the data (bar graph or circle graph)</li> </ul>
CR 2– Production of a message suited to the context, using appropriate mathematical terminology and following mathematical rules and conventions	<ul style="list-style-type: none"> <li>• provides accurate construction of the graph and all elements are properly labelled and graduated</li> <li>• provides relevant information about the data collected using proper terminology:               <ul style="list-style-type: none"> <li>• range: 15</li> <li>• minimum: 12</li> <li>• maximum: 27</li> </ul> </li> </ul>

<b>Competency 3: Communicates by using mathematical language</b>					
<b>Evaluation Criteria</b>	<b>Advanced</b>	<b>Thorough</b>	<b>Acceptable</b>	<b>Partial</b>	<b>Minimal</b>
<b>Correct interpretation of a message involving at least one type of mathematical representation suited to the situation</b>	<ul style="list-style-type: none"> <li>• understands description of survey and demonstrates understanding through correct, complete explanations regarding bias, population, and sample, using all appropriate mathematical terminology</li> </ul>	<ul style="list-style-type: none"> <li>• understands description of survey and explanations contain appropriate elements of mathematical language</li> </ul>	<ul style="list-style-type: none"> <li>• understands most details of survey description and explanations contain some elements of mathematical language</li> </ul>	<ul style="list-style-type: none"> <li>• understands only a few of the survey details and explanations contain only a few appropriate elements of mathematical language</li> </ul>	<ul style="list-style-type: none"> <li>• does not understand survey description and explanations contain in appropriate elements of mathematical language</li> </ul>
<b>Production of a message suited to the context, using appropriate mathematical terminology and following mathematical rules and conventions</b>	<ul style="list-style-type: none"> <li>• explanations regarding bias, population, and sample produce an articulate, coherent message that includes all relevant information</li> </ul>	<ul style="list-style-type: none"> <li>• explanations regarding bias, population, and sample produce a clear, well-organized message that includes relevant information</li> </ul>	<ul style="list-style-type: none"> <li>• explanations regarding bias, population, and sample include elementary, ambiguous, or repetitive information</li> </ul>	<ul style="list-style-type: none"> <li>• explanations regarding bias, population, and sample include confusing and unconnected information</li> </ul>	<ul style="list-style-type: none"> <li>• explanations regarding bias, population, and sample contain erroneous or unrelated information</li> </ul>

## Situational Problem: Presenting Your Findings

Preparation and Planning	
Pacing	15–20 min Introduction 45–60 min Individual work
Materials	<ul style="list-style-type: none"> <li>• computer (optional)</li> <li>• grid paper</li> <li>• a ruler</li> </ul>
Masters	<ul style="list-style-type: none"> <li>• Presenting Your Findings</li> </ul>
Can be done after completing	<i>Nelson Mathematics Secondary Cycle One, Year Two</i> Chapter 3

### Introduction (Whole Class) 15–20 min

As a class, discuss the various ways that survey information could be presented to make the content easier to understand. Discuss the different forms of graphs that students have studied (e.g., bar graphs, broken-line graphs, circle graphs) and when each type provides the best display. Discuss methods for creating graphs (for example, sketching on graph paper or using graphing utilities on a computer). Remind students of the important parts of a graph such as title, labels, key, scales, and intervals.

### Using the Situational Problem (Individual) 45–60 min

As a class, read the introduction, question, and task description for Presenting Your Findings. Remind students to use the Evaluation Criteria Checklist to help them complete the activity. Use of a computer for presenting survey results is optional.

If students are having difficulty...	What you can do to help
Students may have difficulty selecting the most appropriate type of graph for their selected data.	<ul style="list-style-type: none"> <li>• Have them make a list of the types of graphs with which they are familiar.</li> </ul> Ask questions about each type of graph to prompt them in determining the best uses of each.
Students may have difficulty using technology to create their graphs.	<ul style="list-style-type: none"> <li>• Show students the Help command on their computer, where they are able to find the answers to many of their questions about the use of this technology.</li> </ul> Prompt students to use the graphing wizard to create their graphs, with step-by-step instructions.

### Sample Solution (Thorough)

- A. For example, I want to know how Student Council members and other students in my class can help to improve the community in which we live, therefore the population of my survey would be the members of my Cycle One class. There are 198 Cycle One students, so a survey of 25 students should provide me with a good representation of the opinions of my classmates. I will ask those 25 students to choose from a list of five suggestions for projects we could do throughout the school year to make improvements in our community. I will then create a bar graph to show the number of students that selected each project as their top choice.

**B.** For example, “Of the following five project ideas, which would you select as a Community Improvement Project for the Cycle One class?”

- Plant flowers and shrubs in an area near the centre of town
- Help to clean up the park by painting, repairing playground equipment, and cleaning up litter
- Work one day a week at a food bank
- Have a drive to collect coats and shoes
- Prepare holiday meals

**Results:**

Student Council members recently conducted a survey of a sample of the Cycle One students to determine this year’s Community Improvement Project. The five suggestions, given by members of Student Council, included the following projects:

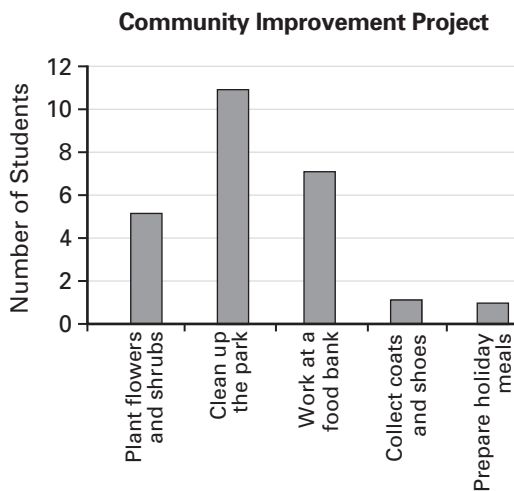
- Plant flowers and shrubs in an area near the centre of town
- Help to clean up the park by painting, repairing playground equipment, and cleaning up litter
- Work one day a week at the local food bank
- Have a drive to collect coats and shoes
- Prepare holiday meals

**Survey Results**

<b>Project:</b>	<b>Number of Students:</b>
Plant flowers and shrubs in an area near the centre of town	5
Help to clean up the park by painting, repairing playground equipment, and cleaning up litter	11
Work one day a week at a food bank	7
Have a drive to collect coats and shoes	1
Prepare holiday meals	1

After polling 25 Cycle One students, the project receiving the most votes was to help clean up the park by painting, repairing playground equipment, and cleaning up litter. This project received 11 votes. The votes for the other suggested projects were as follows: Work one day a week at the local food bank, 7; Plant flowers and shrubs in an area near the centre of town, 5; Have a drive to collect coats and shoes, 1; and Prepare holiday meals, 1. We have, therefore, selected cleaning up the park as our next Community Improvement Project.

The following graph shows the results of our survey:



- C. For example, I followed the plan that I had created before beginning my survey.
- D. For example, I selected a bar graph, because this type of graph is good for comparing sets of data. I wanted to compare the number of votes for each suggested project in a way that makes it easy for my audience to see which project received the greatest number of votes.

I will use the information collected in my survey to plan the next Student Council Community Improvement Project.

## Assessment of Learning: Presenting Your Findings

<b>Competency 1: Solves a situational problem</b>					
<b>Evaluation Criteria</b>	<b>Advanced</b>	<b>Thorough</b>	<b>Acceptable</b>	<b>Partial</b>	<b>Minimal</b>
<b>Oral or written explanation showing that the student understands the situational problem</b>	<ul style="list-style-type: none"> <li>summary includes all of the details that are relevant to the presentation of survey results</li> </ul>	<ul style="list-style-type: none"> <li>summary includes most of the details that are relevant to the presentation of survey results</li> </ul>	<ul style="list-style-type: none"> <li>summary includes some details that are relevant to the presentation of survey results</li> </ul>	<ul style="list-style-type: none"> <li>summary includes a few details relevant to the presentation of survey results, and other information that may not be relevant</li> </ul>	<ul style="list-style-type: none"> <li>information in the summary is not relevant to the presentation of survey results OR student did not complete the task</li> </ul>
<b>Mobilization of mathematical knowledge appropriate to the situational problem</b>	<ul style="list-style-type: none"> <li>presents an accurate survey summary</li> </ul>	<ul style="list-style-type: none"> <li>presents a survey summary with few errors</li> </ul>	<ul style="list-style-type: none"> <li>presents a partial survey summary with some errors</li> </ul>	<ul style="list-style-type: none"> <li>presents a partial survey summary containing the easiest steps with several errors</li> </ul>	<ul style="list-style-type: none"> <li>presents a partial survey summary with several major errors OR no summary</li> </ul>
<b>Development of a solution (i.e. a procedure and a final answer) appropriate to the situational problem</b>	<ul style="list-style-type: none"> <li>planned, conducted, and presented a complete, structured survey</li> </ul>	<ul style="list-style-type: none"> <li>planned, conducted, and presented a complete survey even though some of the steps are not explained</li> </ul>	<ul style="list-style-type: none"> <li>planned, conducted, and presented a survey but it is not well organized and several steps are either not explained or not shown</li> </ul>	<ul style="list-style-type: none"> <li>some portions of the criteria given for planning, conducting, and presenting a survey were not followed</li> </ul>	<ul style="list-style-type: none"> <li>did not plan, conduct, and present a survey appropriate to the given topic</li> </ul>

<b>Cross-Curricular Competencies</b>					
<b>Evaluation Criteria</b>	<b>Advanced</b>	<b>Thorough</b>	<b>Acceptable</b>	<b>Partial</b>	<b>Minimal</b>
<b>Cross-Curricular Competency 1: Uses information</b>					
<b>Critical analysis of information</b>	<ul style="list-style-type: none"> <li>student provided a clear explanation as to how the survey results could be used and included complete details in his/her explanation</li> </ul>	<ul style="list-style-type: none"> <li>student provided an explanation as to how the survey results could be used</li> </ul>	<ul style="list-style-type: none"> <li>student provided some explanation as to how the survey results could be used</li> </ul>	<ul style="list-style-type: none"> <li>student provided an incomplete explanation as to how the survey results could be used</li> </ul>	<ul style="list-style-type: none"> <li>student did not provide any explanation as to how the survey results could be used</li> </ul>
<b>Logical organization of information</b>	<ul style="list-style-type: none"> <li>information was clearly structured, neatly organized, and graph was accurately labelled</li> </ul>	<ul style="list-style-type: none"> <li>information was structured, neatly organized, and graph was labelled</li> </ul>	<ul style="list-style-type: none"> <li>information was somewhat clear and organized, and graph was labelled although some mistakes were made</li> </ul>	<ul style="list-style-type: none"> <li>information was somewhat clear and organized, but graph was not clearly labelled</li> </ul>	<ul style="list-style-type: none"> <li>information was not clearly organized and difficult to understand; graph was not clearly labelled</li> </ul>

Evaluation Criteria	Advanced	Thorough	Acceptable	Partial	Minimal
<b>Cross-Curricular Competency 2: Solves problems</b>					
<b>Accurate definition of the problem</b>	<ul style="list-style-type: none"> <li>student showed a clear understanding of the situation presented and made clear his understanding in his explanations</li> </ul>	<ul style="list-style-type: none"> <li>student showed a clear understanding of the situation presented</li> </ul>	<ul style="list-style-type: none"> <li>student showed a somewhat clear understanding of the situation presented</li> </ul>	<ul style="list-style-type: none"> <li>student showed a lack of complete understanding of the situation presented</li> </ul>	<ul style="list-style-type: none"> <li>student did not show any understanding of the situation presented</li> </ul>
<b>Variety and relevance of solutions proposed</b>	<ul style="list-style-type: none"> <li>an entirely accurate solution was derived from the survey information and a clear explanation was given for the proposed solution</li> </ul>	<ul style="list-style-type: none"> <li>an accurate solution was derived from the survey information</li> </ul>	<ul style="list-style-type: none"> <li>a partially accurate solution was derived from the survey information</li> </ul>	<ul style="list-style-type: none"> <li>an inaccurate solution was derived from the survey information</li> </ul>	<ul style="list-style-type: none"> <li>no solution was derived from the survey information</li> </ul>
<b>Cross-Curricular Competency 6: Uses information and communications technologies</b>					
<b>Effectiveness of his/her use of the technology resources in a given learning context (if used)</b>	<ul style="list-style-type: none"> <li>if used technology, used technology to produce an accurate graphical representation of the data</li> </ul>	<ul style="list-style-type: none"> <li>if used technology, used technology to produce a graphical representation of the data containing only very minor errors</li> </ul>	<ul style="list-style-type: none"> <li>if used technology, used technology to produce a graphical representation of the data containing several errors</li> </ul>	<ul style="list-style-type: none"> <li>if used technology, used technology but did not produce an accurate graphical representation of the data</li> </ul>	<ul style="list-style-type: none"> <li>if used technology, did not use technology to produce a graphical representation of the data</li> </ul>
<b>Cross-Curricular Competency 9: Communicates appropriately</b>					
<b>Coherence of the message</b>	<ul style="list-style-type: none"> <li>wrote a clear and concise summary</li> </ul>	<ul style="list-style-type: none"> <li>wrote a summary that makes sense</li> </ul>	<ul style="list-style-type: none"> <li>wrote a summary that sometimes lacks clarity</li> </ul>	<ul style="list-style-type: none"> <li>wrote a summary that is difficult to understand</li> </ul>	<ul style="list-style-type: none"> <li>did not provide a summary</li> </ul>
<b>Use of appropriate vocabulary or symbols</b>	<ul style="list-style-type: none"> <li>used precise mathematical language in the summary</li> </ul>	<ul style="list-style-type: none"> <li>adequately included mathematics language in the summary</li> </ul>	<ul style="list-style-type: none"> <li>used mathematics language in the summary that sometimes lacked clarity</li> </ul>	<ul style="list-style-type: none"> <li>did not adequately include mathematics language in the summary</li> </ul>	<ul style="list-style-type: none"> <li>did not attempt to include mathematics language in the summary</li> </ul>
<b>Observance of practices, codes and conventions</b>	<ul style="list-style-type: none"> <li>summary includes a clear introduction, an accurate report of data, and a good conclusion</li> </ul>	<ul style="list-style-type: none"> <li>summary includes an introduction, report of data, and conclusion</li> </ul>	<ul style="list-style-type: none"> <li>summary is missing an introduction or a conclusion</li> </ul>	<ul style="list-style-type: none"> <li>summary does not include an introduction and conclusion</li> </ul>	<ul style="list-style-type: none"> <li>summary does not include any apparent organization</li> </ul>

Evaluation Criteria	Advanced	Thorough	Acceptable	Partial	Minimal
<b>Cross-Curricular Competency 9: Communicates appropriately (Continued)</b>					
<b>Appropriateness of the message for the context and audience</b>	<ul style="list-style-type: none"> <li>summary conveyed a very clear message to students and teachers in an easy to understand manner</li> </ul>	<ul style="list-style-type: none"> <li>summary conveyed a clear message to students and teachers</li> </ul>	<ul style="list-style-type: none"> <li>summary conveyed a sometimes unclear message to students and teachers</li> </ul>	<ul style="list-style-type: none"> <li>summary did not convey an appropriate message to students and teachers</li> </ul>	<ul style="list-style-type: none"> <li>summary did not convey any logical message to students and teachers</li> </ul>