

Achievement Standard

Subject Reference	Mathematics and Statistics 3.11		
Title	Conduct an experiment to investigate a situation using experimental design principles		
Level	3	Credits	4
		Assessment	Internal
Subfield	Statistics and Probability		
Domain	Statistics		
Status	Registered	Status date	4 December 2012
Planned review date	31 December 2020	Date version published	17 November 2016

This achievement standard involves conducting an experiment to investigate a situation using experimental design principles.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Conduct an experiment to investigate a situation using experimental design principles. 	<ul style="list-style-type: none"> Conduct an experiment to investigate a situation using experimental design principles, with justification. 	<ul style="list-style-type: none"> Conduct an experiment to investigate a situation using experimental design principles, with statistical insight.

Explanatory Notes

- This achievement standard is derived from Level 8 of *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007; and is related to the achievement objectives:
 - Carry out investigations of phenomena, using the statistical enquiry cycle:
 - conducting experiments using experimental design principles
 - seeking explanations
 - using informed contextual knowledge, exploratory data analysis, and statistical inference
 - communicating findings and evaluating all stages of the cycle
 - Make inferences from surveys and experiments:
 - using methods such as randomisation to assess the strength of the evidence in the Statistics strand of the Mathematics and Statistics Learning Area. It is also related to the material in the *Teaching and Learning Guide for Mathematics and Statistics*, Ministry of Education, 2012, at <http://seniorsecondary.tki.org.nz>.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of the *Marautanga* achievement objectives to which this standard relates, see the [Māori version](#) of the standard.

- 2 *Conduct an experiment to investigate a situation using experimental design principles* involves showing evidence of using each component of the investigation process.

Conduct an experiment to investigate a situation using experimental design principles, with justification involves linking components of the process of investigating a situation by experiment to the context, explaining relevant considerations in the investigation process, and supporting findings with statements which refer to evidence gained from the experiment.

Conduct an experiment to investigate a situation using experimental design principles, with statistical insight involves integrating statistical and contextual knowledge throughout the investigation process, and may include reflecting about the process; discussing how possible sources of variation were dealt with during the design phase; considering other relevant variables.

- 3 The process of investigating a situation by experiment using experimental design principles involves:

- posing an investigative question about a given experimental situation
- planning the experiment using experimental design principles
 - selecting experimental units
 - determining treatment and response variables
 - determining allocation of treatments to experimental units
 - determining data collection and recording methods
 - considering other sources of variation
- conducting the experiment
 - collecting data
 - recording any issues that arise
- selecting and using appropriate displays and summary statistics
- making an appropriate formal statistical inference
- communicating findings in a conclusion.

- 4 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.

Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233

Paerewa Paetae

Aronga	Pāngarau 3.11		
Ingoa	Te whakahaere whakamātau tauanga hei tūhura āhuatanga mā te whakamahi tikanga e whai wāhi ai ngā haukume		
Kaupae	3	Whiwhinga	4
		Aromatawai	Ā-roto
Marau akoranga	Te Marautanga o Aotearoa		
Kokonga akoranga	Pāngarau		
Mana rēhita	Kua rēhitatia	Te rā i mana ai	4 Hakihea 2012
Te rā e arotakengia ai	31 Hakihea 2020	Te rā i puta ai	17 Whiringa-ā-rangi 2016

Te Hononga ki te Marautanga

I ahu mai tēnei paerewa paetae i te Taumata 8 o *Te Marautanga o Aotearoa*, i whakaputaina e Te Pou Taki Kōrero i te tau 2008.

Whāinga Paetae

Te Tauanga, Te Tūhuratanga Tauanga

1 *Ka whai i ngā tikanga mō te tūhuratanga tauanga:*

- *ka whakahaere whakamātau tauanga mā te whakamahi tikanga whakamahere whakamātau tauanga, ka whakamahi rānei i ngā huinga raraunga kua oti kē te kōhi mai;*
- *ka whiriwhiri, ka whakamahi, ka arotake i ngā tauira tauanga e whaihua ana ki te whakatakoto matapae, ki te kimi whakamārama;*
- *ka whakamahi mōhiotanga ki te horopaki o te tūhuratanga, ka whakamahi tikanga tātari hōpara;*
- *ka whakamārama i ngā whakakitenga, ka arotake i ngā wāhanga katoa o te tūhuratanga;*
- *ka mārama ki ngā tikanga matatika e hāngai ana.*

E hono ana ki te Papa Whakaako mō te Pāngarau kei te pae tukutuku nei:

<http://tmoa.tki.org.nz/Te-Marautanga-o-Aotearoa-Taumata-Matauranga-a-Motu-Ka-Taea>

Te Hononga ki *The New Zealand Curriculum* (NZC)

I ahu mai hoki tēnei paerewa paetae i *The New Zealand Curriculum*. Mō ngā kōrero e pā ana ki ngā whāinga paetae o te NZC e hāngai ana ki tēnei paerewa, tirohia te [putanga reo Pākehā](#) o te paerewa.

Te Hononga ki ngā Tikanga Aromatawai

Arā ngā Tikanga Aromatawai mō tēnei paerewa paetae, kei te:

<http://tmoa.tki.org.nz/Te-Marautanga-o-Aotearoa/Taumata-Matauranga-a-Motu-Ka-Taea>

Paerewa Paetae

<p>Paetae Te whakahaere whakamātau tauanga hei tūhura āhuatanga mā te whakamahi tikanga e whai wāhi ai ngā haukume.</p>	<p>Hei tohu i te paetae:</p> <ul style="list-style-type: none"> • Ka whai i ngā tikanga mō te tūhuratanga tauanga: <ul style="list-style-type: none"> – Ka whakahaere whakamātau tauanga mā te whakamahi tikanga whakamahere whakamātau tauanga. – Ka whiriwhiri i tētahi horopaki whitake hei tūhura. – Ka whakamahi, ka arotake i ngā tauira tauanga e whaihua ana ki te whakatakoto matapae, ki te kimi whakamārama – Ka whakamahi mōhiotanga ki te horopaki o te tūhuratanga, ka whakamahi tikanga tātari raraunga hōpara. – Ka whakamārama i ngā kitenga, ka arotake i ngā wāhanga katoa o te tūhuratanga. – Ka mārama ki ngā tikanga matatika e hāngai ana.
<p>Kaiaka He kaiaka te whakahaere whakamātau tauanga hei tūhura āhuatanga mā te whakamahi tikanga e whai wāhi ai ngā haukume.</p>	<p>Hei tohu i te kaiaka:</p> <ul style="list-style-type: none"> • Ko te parahau i ngā wāhanga o te whakamātau tauanga te mea nui. Nō reira, ka kitea ēnei: <ul style="list-style-type: none"> – ka tūhono i ngā wāhanga o roto i te whakahaere whakamātau tauanga ki te horopaki. – ka whakaputa kōrero taunaki e hāngai ana ki: <ul style="list-style-type: none"> ○ te tukanga whakahaere whakamātau tauanga. ○ ngā kitenga i puta mai i te whakamātau tauanga nei.
<p>Kairangi He kairangi te whakahaere whakamātau tauanga hei tūhura āhuatanga mā te whakamahi tikanga e whai wāhi ai ngā haukume.</p>	<p>Hei tohu i te kairangi:</p> <ul style="list-style-type: none"> • Ko te whakaatu aroā tauanga hōhonu te mea nui. Arā, kia kotahi, nui ake rānei o ēnei: <ul style="list-style-type: none"> – ka kōtuitui i te mātauranga tauanga me te mārama ki te horopaki, i roto i ngā wāhanga katoa o te tūhuratanga tauanga. – ka arohaehae i te tukanga tauanga me ngā whakamārama e hāngai ana ki ngā āhuatanga i kitea atu pērā i ngā haukume me ētahi atu.

Kōrero Āpiti

Kuputaka:

aroā tauanga
haukume
tauira tāpiripiri
tikanga hīkaro tauanga
tikanga tātari hōpara

statistical insight
bias (sources of)
additive model
statistical inferencing techniques
exploratory analysis techniques

Tātari Kounga

- 1 Me mātua whakamana ngā Kaituku Akoranga me ngā Whakahaere Whakangungu Ahumahi e te Mana Tohu Mātauranga o Aotearoa ka rēhita ai i ngā hua ka puta mai i ngā aromatawai ki ngā paerewa paetae.
- 2 Ko ngā Kaituku Akoranga me ngā Whakahaere Whakangungu Ahumahi kua mana, ā, e aromatawai ana i ā rātou hōtaka ki ngā paerewa paetae, me uru rātou ki ngā pūnaha whakaōrite e tika ana mō aua paerewa paetae.

Ko te tohutoro ki te Mahere Whakamana, Whakaōritenga hoki 0233