National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard

Technology Level 3

This exemplar supports assessment against:

Achievement Standard 91615

Demonstrate understanding of consequences, responsibilities and challenges involved in technology

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

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	Grade Boundary: Low Excellence
1.	For Excellence, the student needs to demonstrate comprehensive understanding of consequences, responsibilities and challenges involved in technology. This involves: • discussing the probable future technological developments in a specific field, justifying these with past and/or contemporary evidence • discussing why technological intervention challenges people's perceptions of what it means to be human. This student has introduced a possible future trend in gaming – that of incorporating the player into the game in a physical sense (1). This was justified with evidence related to what is currently being developed (2). The student also begins to discuss why technological intervention challenges people's perception of what it means to be human (3). For a more secure Excellence, the student could have shown more justification of future technological developments against past evidence and have widened discussions as to why technological interventions challenge people's perception of what it means to be human.

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Student 1: Low Excellence

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In the near future and beyond, our advancing technological capabilities will most likely play a more important role in how we interact with games. Already a future trend in games is for them to be more interactive enabling the player to become part of the game itself, taking the idea of first player capability to a new level. The next generation of games is taking advantage of this emerging technology by incorporating the player further into the game, by adding in the physical. 1

The futurist (www.thefuturist.co) has already begun to examine some of the ideas technologists have come up with for video games of the future.
Instead of the current trend of 3D environment games (such as PlayStation's Crash Bandicoot, or Grand Theft Auto III), future games could have the players moving freely within the game. For example, 3D multi touch is a prototype that uses hand detection to enable the player to grab objects closely. This technology incorporated into a game may enable the player to grab a sword and physically defend themselves against opponents.

Another emerging interactive technology is Natal's 'Milo' being created for XBox 360. The technology that has developed sees the character 'Milo' recognising faces, voices and emotions, enabling him to fully interact with the player. This allows the player to feel connected to 'Milo's' world as it is like meeting a real person on screen. 2
The technology involved in XBox 360 means that every motion and hand movement by the player is being recognised and informs what 'Milo' chooses to do. A video clip from www.thefuturist.co shows the player drawing a picture of a fish and showing it to 'Milo'. 'Milo' looks at the image (i.e. scanned by Xbox 360) who then comments on it making the player feel connected to the game. This real-time interaction is also carried over to images on the screen reflecting the players every hand movement. For example, the technology has recognised that the player has swished their hand through a pool of water, creating a ripple, which is then reflected in the pond onscreen.

Other probable future developments may be games, which all the player has to do is think of an action and it will be done. For example, the player could think about casting a spell and it would be done instead of pushing a key to enable the action. This cognitive genre of game may already be emerging with the 'emotive EPOC' technology (www.thefuturist.co), which is based on human interaction in a virtual environment.
This next generation of game may allow the player to interact on a more personal level, using such things as expressive detection, which means the technology recognises and understands facial expressions, such as a player smiling. The virtual environment (an onscreen character) would recognise this expression and incorporate it into the character allowing it to become more realistic. By adjusting the game to personalise the player's experience, the character becomes more intuitive, intensifying the mood of the game for the player.

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We make our technologies and they in turn shape us. Rapid advances in technology are challenging our perception of what it means to be human. The idea of technology being implemented into the human body, enhancing our capabilities, correcting flaws and defects, boosting our natural abilities is blurring the boundary between humans and machines, making us question what we are becoming. 3

It is recognised that human qualities and values have played a role in both the creation and the use of technology with advances in games following this trend. Developments in gaming technology are often linked to the wants of the player, such as players wanting more realism, which results in more complex games being developed (3D and online mega games). Technology at first was a tool, but as technologies developed, so did the idea of Artificial intelligence (AI), a machine that is an extension of the human 'mind'. In recent years, this idea of a ‘cyborg’ machine that comes close to the ideal human body is often portrayed in movies, such as StarTrek’s cyborg ‘Data’ or in iRobot staring Will Smith.

This blending of technology and human characteristics into machines is reflected in the more complex games on the market today, how we interact with these games and any future developments. Technology when incorporated into games allows us to make decisions and learn from them in ways that may not be possible in real life. 11 This alternative reality allows the player to become who they want to be, as does the realism of human characteristics evolving in games to better reflect our body shape, motor skills and dexterity. Learning through play is not a new concept and todays games reinforce this drive to learn new things, for example a more realistic character that has the capacity to make decisions (Xbox 360 ‘Milo’), will ultimately influence the way in which we view what it means to be human]

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	Grade Boundary: High Merit
2.	For Merit, the student needs to demonstrate in-depth understanding of consequences, responsibilities and challenges involved in technology. This involves discussing how the consequences of a technological development in a specific field have influenced the responsibilities of technologists over time. This student has provided an in-depth discussion on how the evolution of gaming platforms from console to online has influenced the ethical responsibilities of software developers and technologists. This includes how changes to gaming platforms have resulted in technologists having to consider wider ethical responsibilities (1), technologists' consideration of factors such as the new diversity of audiences' social consequences being reflected in the wider diversity of games available (2), the impact of emerging technologists changing the landscape of gaming (3), and the blurring of lines between reality and game playing and effects (4). To reach Excellence, the student could discuss future technological development and justify with past and/or contemporary evidence.

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Student 2: High Merit

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Games now also use additional means of providing interactivity and information to the player. For example, early PC games only needed a keyboard for gameplay, with the primary means of manipulating the game being through 'hotkeys'. But as new software developed, such as the Mac 'interface' (the design system enabling the mouse to click and select), players had to learn how to use the keyboard and mouse simultaneously. As new technologies are being introduced, such as the change to CDs allowing greater storage, players often needed to buy separate components (joystick or xbox). Audio is almost universal using devices, but extras such as speakers and headphones also are brought. Technologists who are considering sustainability management are effectively reusing components of previous game developments enabling new games to be more cost effective. For example, games that were previously only being played on consoles such as xbox or nintendo can now be purchased and played online limiting the waste of resources and extending the lifespan of products.
The societal consequences of this evolution of video gaming platforms, is the wider the audience, the wider the diversity of the games being developed. Games are reflecting the type of environment they are being created for. 1

For example, smart games are becoming more interesting as technologists realise the more complex the game, the more time a player will invest in them. One of these examples is social skill game's that can be used in the classroom. Games are one of the best ways to teach social skills and within a video game allow a safe environment where students can use and practice their skills, provide fun and interaction among the players, and cause walls of insecurity to crumble. 2

This understanding of how the wider audience is influencing future developments are reflected in how advances in technology has often been alongside the growing diversity of technologists (e.g. kids, women). For example, the influence of new platforms such as Gamemaker (a free application that enables beginners to create video games) is allowing kids to make their own games. The influence of more female technologists such as Jade Redmond (the creator of Assassin's Creed, one of the most popular games of all time) has had an impact on the style and appeal of games, this new genre attracting a broader audience.
The landscape of games has also changed dramatically with the blurring of lines between real life and game playing and the latest in technological developments add to this by including such things as physical innovations (Wii), as it fully involves the player, challenging our understanding of what it means to be human. Human needs and wants have a new appeal when you can choose your own reality, such as developing friendships online, or becoming a Wii Tennis star. 3

Gaming has always been a social event and the latest in studies have shown some positive effects relating to players having more social activity and cognitive ability. Instead of the idea of games erasing players personalities, games are now being developed that encourage goal setting and achieving them, expanded social skills such as meeting people (online), interaction with and growing confidence in using different media (for example, exercising through Wii). 4

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	Grade Boundary: Low Merit
3.	For Merit, the student needs to demonstrate in-depth understanding of consequences, responsibilities and challenges involved in technology. This involves discussing how the consequences of a technological development in a specific field have influenced the responsibilities of technologists over time. The student begins to discuss how the consequences of a technological development in video games have influenced the responsibilities of technologists over time. The student included such things as how advancing technology has pushed the boundaries of existing games to appeal to a wider audience (1), which in turn has broadened technologists' ethical and social responsibilities in online gaming (2) and how the gaming platforms are benefiting society (3). For a more secure Merit, the student could provide more evidence of this type of discussion, including, for example, the consequences that are intended and unintended, known and unknown.

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Student 3: Low Merit

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Games are now marketed to a wider audience that has led to developments in the complexity of games being created. Play is how we learn, and when used in video games it allows the player to explore new experiences, which may not be physically possible. Ever advancing technology has fostered more lifelike and complex games, which in turn have introduced or enhanced possibilities (virtual pets), pushed the boundaries of existing video gaming or in some cases add new possibilities in play (using movement such as in Wii) to a wider audience. This in turn leads to new ethical responsibilities that technologist need to adhere to in order to promote games to a wider audience. 1

The original target market of games was children but now everyone can be a gamer. Gamemaker for example, is a free application which encourages students to create video games, and has a built in script language that allows students as they advance in understanding to create more complex games

This broader environment means technologists have a responsibility to address such factors like the protection and safeguarding of players emotional and physical wellbeing, regardless of age. 2

Original console games, such as Super Mario Brothers, are simple storyboard format games that can be played with one or two players. The responsibilities of technologist were mainly to do within the development of the game. For example, when creating the game, cultural, political or economic factors would have been considered before the game was sold, during the developmental stage. Now as online games are becoming more popular, broader reaching ethical responsibilities have to now also be considered. Web based games (such as (MMORPGs) like RuneScape, World of Warcraft, and EverQuest) have a wider audience that extends beyond the 2 person console games of previous platforms. Group playing has potential societal consequences that have to be addressed beyond the developmental stage. For example, games that are aimed at an older audience are R rated, needing login or passwords to play, while younger audiences need internet safe games to protect the wellbeing of players.

The recent impacts on the social world from technological developments have increased our understanding of the potential social and physical benefits of games. Gaming has traditionally been a social experience that is also a rapidly growing mainstream hobby and also as a learning media which may help students to learn traditional abstract concepts by making them visually appealing. Technological advances of gaming platforms (facebook, twitter) now allow social network games to be implemented on other platforms such as mobile devices, like the iPhone developed in 2007 the player interfaces with a multi-touch screen and virtual keyboard. This genre of browser games are amongst the most popular games played in the world, with millions of players, which strongly add to the appeal of games becoming mainstream. 3

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	Grade Boundary: High Achieved
4.	For Achieved, the student needs to demonstrate understanding of consequences, responsibilities and challenges involved in technology. This involves: • explaining the consequences of a technological development in a specific field over time • discussing the responsibilities of technologists in a technological development in a specific field over time • explaining how technological intervention challenges people's perceptions of what it means to be human. The student has explained the consequences of gaming platform developments in video games over time (1) and how technological intervention challenges people's perception of what it means to be human (2). Part of this explanation also includes how the increased potential market of gaming platforms has a direct influence on technologist's responsibilities (3). To reach Merit, the student would need to show discussion surrounding how consequences of a technological development in gaming have influenced the responsibilities of technologists over time.

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Student 4: High Achieved

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The consequence of technological developments in video gaming over time is how the increased potential market to the mainstream population is having a direct influence on technologist's responsibilities.

Video games reached mainstream popularity in the 1980's starting with arcade games and going onto home-based computer games (e.g. Dungeons & Dragons being one of the first computer role playing video games).
Dune II (based Frank Herbet's science fiction novel Dune) is one of the first real-time strategy games, using the innovative 3D graphics being developed at that time. These technological developments led to several transitions of these games, which then established a format to follow for years to come, striking a balance between complexity and innovation.
The player is a military commander from a house of his choice. In the first few missions the objectives are to establish a military base on unoccupied territory, to defeat intruders. As the complexity increases so do the challenges until a final showdown, a battle between the players house and enemy sides. The basic strategy of the game is to harvest spice and convert it into credits that can be used to build military units to defeat the enemy.
A Key element that first appeared in this game is the technology tree, a visual representation of the possible decisions a player can take by means of research. This allows the player to choose one sequence or another. At the start of the game the payer may only have a few options but as they progresses more options open up, or not, depending on the game the player is playing.
Another was the Mac software 'interface', the design system enabling the mouse to click and select. Brett Sperry, co-developer of Dune II states that this technological development made them question previous game strategy. "Why not allow the same inside the game environment? Why not a context-sensitive playfield? To hell with all these hot keys, to hell with keyboard as the primary means of manipulating the game!"

1

As home based computers became more affordable, the popularity of this style of game appealed to a wider audience, due to it being easier to play, and more realistic.
This led onto further ethical responsibilities that technologists now needed to consider. For example, a wider societal consequences involved in playing electronic games is time. Increased time invested into the development of games has had a direct impact on the amount of time players now spend playing games, due to there increased complexity and realism, impacting on the player's physical and emotional wellbeing. For example, old style video games like Pac-man were simple in complexity and designed for short impromptu play so time invested by players was moderate as was the platform (arcade) it was being played on.
As innovations in video gaming developed so did the platforms and time being invested by players. As broadband became more affordable, an increase in the popularity of online games has changed how gamers interact. Named 'massive multiplayer online role-playing games' (MMORPGs) for the number of players, MMORPGs such as World of Warcraft currently the worlds most-subscribed game, require the player to pay for a subscription, either by buying prepaid game cards for a selected amount of playing time, or by using a credit to pay on a regular basis. This dramatic change has resulted in internet safety being a large part in responsibilities of technologists.

3

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Another ethical responsibility for technologists that has evolved in recent years is sustainability management, as with the increase in technological developments comes the wider use of resources. Technologists need to establish responsibilities of the care of our environment. For example, games are expensive as a lot of time and money has gone into developing them but as the technology increases so does the demand for newer faster games and/or consoles, potentially making the lifespan of previous games shorter.

3

Human intellect and will for example, are how we make decisions and the importance of personal choice. Games allow us to make decisions and learn from them in ways that may not be possible in real life. For example, the popular SimCity series allows the player to create a society from scratch, with players seeing the direct effect when they choose to do something or nothing. Another growing trend is mega online games that develop their own social culture building up around them. Learning through play is not a new concept however games today reinforce that drive to learn new things, which is fundamentally what makes us human.

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	Grade Boundary: Low Achieved
5.	For Achieved, the student needs to demonstrate understanding of consequences, responsibilities and challenges involved in technology. This involves: • explaining the consequences of a technological development in a specific field over time • discussing the responsibilities of technologists in a technological development in a specific field over time • explaining how technological intervention challenges people's perceptions of what it means to be human. This student has explained how technological innovations are driving consumer preferences and how games are now marketed to a wider audience (1). The student has begun to discuss the interrelationship between technological advances and technologists' wider ethical responsibilities in a broader environment including how design changes are influenced by social behaviours, thus ensuring the players' wellbeing (2). The student has explained how alternative realities are challenging what it means to be human, the growing realism of human characteristics within games, how this impacts on use of leisure time, and the effects of the wide appeal of games (3). For a more secure Achieved, there should be a broader discussion and explanations surrounding the students understanding of consequences, responsibilities and challenges involved in technology.

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Student 5: Low Achieved

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Technological development in video gaming have impacted on the made world through the rapid development of gaming products, which are a direct result of consumer preferences linking to technological innovations. Ever advancing technology and production values related to video game development have fostered more lifelike and complex games, which in turn have has led to technologists now having more ethical responsibilities to safeguard the players in this broader developing environment. 1

At the start of the industry, it was more common for a single person to manage all of the roles in creating a video game that was mostly developed for teenage boys. But now games are developed in teams and marketed to a wider audience (children, teenagers and adults) depending on the nature of the game.

The game Quake was one of the first games to be played over the Internet, beginning the trend for password protected and multiplayer capability now in most FPS (first person shooter) games. This genre although is centered on gun and weapon based combat through first-person perspective, was one of the first examples of technologist needing to be able to restrict access to players who were unsuitable due to the violence in the game.

In multiplayer mode players on several computers connect to a server, where they can either play together or against each other. The most popular mode is a form called ‘death-match’, consisting of either free-for-all (no organisation or teams involved), one on one duels or organised team play. This game was unique for its time because of the different ways a player can maneuver through the game. For example, the non-realistic behavior idea that the player can start and stop moving suddenly, jump unnaturally high, and change direction while moving through the air appealed to gamers.

With the growth in the industry, development studios have needed to define acceptable behaviors that promote high standards in the software being developed to ensure profitability of the video game for the intended target market, thus ensuring the protection of the player’s emotional and physical wellbeing. For example, the protection of players has evolved to include such things as, R rated or web-based games needing a logon or password to play the game, allowing technologists to control who the games are being created for. "The R 18+ category will inform consumers, parents and retailers about which games are not suitable for minors to play, and will prevent minors from purchasing unsuitable material”. 2

As broadband became more affordable, an increase in the popularity of online games like World of Warcraft has changed how gamers interact named ‘massive multiplayer online role-playing games’ (MMORPGs) for the number of players, technologists also have developed technology to restrict access to unsuitable players.

Human characteristics such as movement, environmental adaptability and natural evolution in body characteristics have been implemented into video games, and over time becoming realistic as technology develops. The next evolution in video games is challenging what it means to be human by creating alternative realities. It challenges our perception of human characteristics and how we spend our leisure time. For example, in the next evolution of the popular SimCity games, Spore allows the player to choose their characteristics, beginning with a single cell organism. By adapting this cell to different environments the player then develops flexibility of movement and so begins a natural evolution of the characters body characteristics The appeal of these games is in the choosing of an alternative reality, which has no limit on physical form or environment; it challenges how we make decisions and the importance of personal choice. 3

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	Grade Boundary: High Not Achieved
6.	For Achieved, the student needs to demonstrate understanding of consequences, responsibilities and challenges involved in technology. This involves: • explaining the consequences of a technological development in a specific field over time • discussing the responsibilities of technologists in a technological development in a specific field over time • explaining how technological intervention challenges people's perceptions of what it means to be human. This student has described the consequences of how technological developments in gaming have changed over time (1), how the responsibilities of technologists are changing with the evolution of the gaming platform, (2) and begins to identify the effect games have on what it means to be human (3). To reach Achieved, the student should move beyond description, to explaining and discussing the consequences of video gaming. The explanation of how technological intervention challenges people's perceptions of what it means to be human should also be widened.

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Student 6: High Not Achieved

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When arcade video games, gaming consoles and home computer games were introduced in the 1980's they rapidly became very popular and are now an important part of societies entertainment. Innovations in video gaming like the transition to 3D graphics (e.g. Sonic the Hedgehog) led to several genres of video games being developed such as first-person shooter and real-time strategy games. (e.g. Command & Conquer). 1

As greater computer hardware was developed, other advances in technology (Java and Adobe Flash) allowed for simple single player or multiplayer games that can be quickly downloaded and played without installation, such as SimCity which quickly became the best selling computer game of all time. Games are now widely marketed and the change to CDs allowed greater storage, which led to developments in complexity and this non-linear style of gameplay. For example, Crash Bandicoot was one of the first to have a fully 3D environment and Grand Theft Auto III uses a third-person camera perspective. Both are very successful commercially and are considered huge milestones in gaming.

Technological advances such as the iPhone by Apple in 2007, and social network games like Happy Farm in 2008, which attracted 23 million daily users in China, strongly add to the appeal of video gaming now becoming more mainstream.

Advancing technologies relating to video gaming has in turn pushed the boundaries of technologist's responsibilities. PC based games due to technical limitations only need the technologists safeguarding player's wellbeing through such things like the content being introduced and R ratings. As technology has developed to webased online games, technologists now need to include such things as logons or passwords to protect against players accessing restricted games. 2

Games challenges people perception of what it means to be human by allowing the player to choose their own body shape and size, and in some games the environment. Players in reality are fixed in form but within a video game you can become whoever you want with different abilities. For example, SimCity by Maxis allows the player to create a society from scratch allowing the player to see the instant effect of what happens when they cooperate, interact or are in competition for elements in the game. 3

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