Information technology in a global society (ITGS)

Contents

Grade boundaries

Higher level overall

Grade:	1	2	3	4	5	6	7
Mark range:	0-13	14-27	28-42	43-52	53-62	63-72	73-100

Standard level overall

Grade:	1	2	3	4	5	6	7
Mark range:	0-10	11-22	23-34	35-46	47-58	59-70	71-100

Standard / Higher level internal assessment

Grade:	1	2	3	4	5	6	7
Mark range:	0-4	5-8	9-11	12-15	16-18	19-22	23-30

Higher level paper one

Grade:	1	2	3	4	5	6	7
Mark range:	0-8	9-16	17-24	25-29	30-34	35-39	40-60

Standard level paper one

Grade:	1	2	3	4	5	6	7
Mark range:	0-3	4-7	8-13	14-17	18-22	23-26	27-40

Standard / Higher level paper two

Grade:	1	2	3	4	5	6	7
Mark range:	0-3	4-6	7-9	10-12	13-16	17-19	20-26

Higher level paper three

Grade:	1	2	3	4	5	6	7
Mark range:	0-4	5-9	10-16	17-19	20-21	22-24	25-30

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Higher and standard level internal assessment

The range and suitability of the work submitted

- The findings from the November 2018 session for ITGS Internal Assessment - Higher and Standard Level are consistent with those in Internal Assessment: Higher and Standard Level in the ITGS May 2018 Subject Report. Therefore, the May 2018 Subject Report needs to be considered along with the observations highlighted in this report.
- Most ITGS Projects were developed following the assessment criteria and submitted according to the submission requirements. The My IB ITGS discussion forum has been used by ITGS teachers for advice regarding the ITGS Project. A current ITGS Project checklist has also been provided in the discussion forum.
- The most successful projects had:
    - well-defined user requirements from the start
    - a straightforward product was planned
    - a detailed product design
    - evidence the student met frequently with the client
    - achievable expectations based on appropriate feedback.
- Generally, the client, the problem addressed, and the IT solutions were appropriate. In some instances, the product was poorly designed, too simplistic or contained too little content.
- Candidates used Forms.zip to develop the contents for the ITGS Project folder. The templates and file/folder names should not be changed.
- The Teacher Marks Justification Forms were included within the ITGS Projects zipped files in the sample. They included the marks awarded and the teacher's comment for each of the assessment criteria. However, some lacked an explanation of how the marks were awarded.
- ITGS teachers generally awarded marks higher than the moderated marks. This indicates a misinterpretation of the assessment criteria.

The vast majority of candidates (approximately 80%) develop websites with the remainder mainly databases and a few videos. In general, video solutions were neither thoroughly planned nor well developed.

Some schools seem to be using a 'recipe based'/templating approach, so it is easy to see which projects are from which school. Criterion C also is prone to schools using a generic approach, i.e. the same information and only changing the name of the client.

Candidate performance against each criterion

On all criteria, there is a lack of detail relating to the specific client, problem, product, process, design, tools, resources, and techniques. Much of the documentation is generic and the comments could relate to any product being developed.

Criterion A

There seemed to be a balance of Projects developed for persons known to the student and members of the school community. Almost all clients were appropriate. The initial consultation continues to be weak and the questions asked do not always provide sufficient evidence for Criterion A. It was not always clear what the requirements the IT solution would need to address.

The major problems in the initial investigation were the lack of explicit reference to the interview and/or the lack of understanding of the meaning of "inadequacies of the current situation". Most candidates continue to elaborate on the problem rather than describing the current situation and explaining its inadequacies. In a few cases, candidates also failed to identify an actual person as the client – a company or institution was identified instead.

Criterion B

The Specific performance criteria (SPC), in most instances, were simple and/or not measurable. The SPC are important as a basis for testing in Criterion E and for evaluation in Criterion F. Other omissions included the lack of details for the hardware and software used and the lack of understanding of what "system interaction" means. Too often students only described how the user would interact with the system. In many projects the candidates did not include the provision for backup. The justification for the chosen solution was, in most instances, adequate.

Criterion C

In roughly 50% of the projects, the Criterion C that was submitted could have been used for any other project where the same type of product is developed. In most of these cases, the only item that changed was the name of the client. Not all stages of development were included. Project schedules must include details of the specific client, problem, solution being developed, techniques being used.

Criterion D

It seems that students are not aware of how to design the products that they are creating: website, database or video. Diagrams were often inappropriate, lacked detail and were not accompanied by appropriate annotations. Students need to research how to best present the overall structure and internal structure/design for the products being developed. In general, the resources neglected to include all the sources of content and the URLs of websites that were consulted. Testing was often superficial and did not always test the SPC in Criterion B. The client's signature in most cases was provided. However, there were a few instances where students inappropriately typed the client's name in a script font.

Criterion E

The tools used were appropriate, but the techniques, in some cases, were basic. Wherever code is used, the source of code must be provided, the key features of the code highlighted and a screenshot showing the outcome of the code. Most marks fall in the mid-range of 3-5 marks.

Approximately 50% of the candidates did not provide the overall structure of the product and/or the folder structure under Criterion E. This demonstrates that they did not read (or did not follow) the IA criteria and/or they were not properly guided by their teachers.

One serious situation that needs to be observed with more care by **examiners is the excessive use of words in text boxes under Criterion E**, in what appears to be an attempt by the candidate **to circumvent the word count**. In some cases where the number of text boxes with long sentences and excessive number of words caught the attention of the examiner, and on further analysis it was found out that Criterion E (and therefore the entire IA) had more than 300 words than what was reported. This led to Criterion F being awarded zero marks, as by this point the IA had exceeded the permitted 2000 words.

Criterion F

It seemed that most products met the client's needs and were functional. However, the feedback from the client was not always aligned with the evaluation of the product. The importance of stating measurable SPC in Criterion B is not always realized. The SPC should relate to both aspects of the product: technical requirements and the content. Some students did not include the SPC in the Feedback from the client and therefore had little basis for the evaluation in Criterion F. At times, the Recommendations for the future development of the product referred to simple features that should have been included in the current product or to superficial or unrealistic suggestions. Most students do not seek advice in this area from their client.

Criterion G

The marks awarded on Criterion G, which has 4 technical requirements, were often inconsistently awarded. In a number of cases the teacher awarded a mark without any evidence, for example with no subfolders within the Product Folder. Screencasts must be provided to demonstrate that the product is fully functional, contains sufficient content and demonstrates the techniques highlighted in Criterion E. The insights into how the student developed their Project are through entries in Criterion C and the screencast. There were a limited number of silent screencasts which are not helpful because they rely on the moderator trying to 'guess' what is being demonstrated.

The major problem for students in Criterion G was the cover page. All the links of the cover page must be tested in different computers and different networks prior to the submission of the project. Frequently, it is just one link (such as the product link) that does not work. However, in other cases, it was the whole cover page.

Recommendations and guidance for the teaching of future candidates

For additional information regarding the ITGS project, please consult:

- ITGS Guide (pages 56-72)
- Teacher Support Material (Internal Assessment)
- Forms.zip templates
- Guidance on the appropriateness of an Information Technology solution for the project

- ITGS Subject Reports, especially those from May 2017, November 2017 and May 2018

Project Checklist at https://docs.google.com/document/d/1z78MuvNcUR3tSIypG42-PSIFHiOmzIwaQAS0qYTv8tI/edit

For additional professional development regarding the ITGS Project, please participate through:

- My IB ITGS discussion forum and My IB ITGS Project group
- ITGS online workshops (cat 1, cat 2) or ITGS face-to-face workshop (cat 1, cat 2, cat 3)

Higher level paper one

General comments

Higher level (HL) Paper 1 and Standard level (SL) Paper 1 are separate components. However, many of the comments that apply to one component apply to the other. Given the overlap between the HL and SL papers (three out of the four SL questions also appeared on the HL paper), **comments offered for SL Paper 1 should be read in conjunction with those for HL Paper 1.**

In this session the three questions common to both papers were as follows:

Q1 - Google healthcare data

Q2 - Cell phone farmers

Q3 - Sports photographs

The comments for these common questions are included within the HL Paper 1 comments on specific questions.

The areas of the programme and examination which appeared difficult for the candidates

In part (b) when the command term is "analyze" few candidates went beyond description to engage in analysis supported by reasoning and detail.

This example from part b illustrates how to approach analyze and explain questions.

Part (b) offered some explain questions that were worth three marks. Answering "analyze" and "explain" questions can also be difficult for students. The command term asks students to explain why something occurs, why it is important to the point s/he is making, or describe the consequences of a policy/action/ uses of IT. Each of these requires specific support.

"Pattern recognition is used in machine learning. The software looks for recurring patterns in the data in order to learn information about how to come to a conclusion, e.g. how to make a decision or how to respond. "

Student has explained basically what pattern recognition does.

"Pattern recognition would allow Dennis to learn and develop when exposed to new situations, improving his functionality. As customers are unlikely to say exactly the same phrases or words, pattern recognition would allow Dennis to identify an appropriate response or action from previous data."

Student adds further explanation indicating that pattern recognition can deal with new situations.

"Pattern matching would require Dennis matching customer's sentence to programmed sentences, and then saying the appropriate response."

Student has explained basically what pattern matching does.

"This may take longer than pattern recognition, decreasing customer satisfaction and the response may not be appropriate in the context. More importantly, it is impossible for every single phrase a customer may say to be programmed into Dennis for pattern matching, meaning he would not be able to respond to unknown phrases."

Identifies and explains the key problem with pattern matching.

"Pattern recognition would overcome this issue."

Justifies the use of pattern recognition.

These two examples from the May 17 Subject Report illustrate two approaches to part (c) questions.

Part c of the questions posed the most significant problems. A number of candidates in this cohort are still writing lists, usually of advantages and disadvantages, sometimes with minimal description, and often in the form of bullet points.

However, the command terms for part (c) questions should elicit developed arguments, not lists. To earn a 5 or above for these questions, candidates need to show evidence of critical thinking by providing arguments that are supported by reasoning, examples, and details. Some candidates did show evidence of the ability to apply what was learned in class to new situations.

In this first example note that the student is writing inductively. The main idea is the last sentence in the paragraph. Words that clarify the logic of the answer have been highlighted.

Student text	Comments
One of the issues that an AUP may educate students about is cyberbullying, and it may be included in a school's AUP that students should not use the internet to threaten or bully other students, for example by sending offensive messages or images over social networking websites.	*The student shows understanding of the nature of an AUP by describing a specific example.*
By including this in their AUP, schools can hold students accountable for their actions, as students will often have to sign the AUP at the start of the year. If a student then engages in cyberbullying behaviour, they will have breached the AUP and the school may punish them accordingly.	*Explains in detail how this use of the AUP might work.*
Hence, the use of an AUP may discourage students from cyberbullying by holding them	*Analyzes the impact of this use of an AUP.*

accountable for their actions and making them aware of the consequences of such actions.	
However, an AUP may not be enough to eliminate cyberbullying at schools.	*Introduces the idea that the impact previously explained may well be limited.*
An example, of this was a recent case of a secondary school in Victoria, Australia, in which images of students at the school were shared in a private Facebook group without the knowledge or permission of the people in the images	*Illustrates the point with a specific example which could have been discussed in class or could have come from the student's own reading.*
Even though an AUP was already in place, and students had been warned about the consequences of such behaviour, this ultimately did not deter them from behaving as irresponsible digital citizens.	*Draws the conclusion that impact of AUP can be limited.*

The second example, taken from a previous exam, illustrates a deductive approach to responding to a part (c) question. Note the use of words that clarify the logic of the argument such as hence and however, as well as the use of for example.

Note that the student has qualified the initial assertion by saying that the data must be protected and used properly. This sets up the disadvantages explained later in the essay.

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ITGS Command Terms
~ ITGS Guide 2012 onwards ~

[Updated for ITGS Guide 2012 onwards /based on work by Rachel Dewey © 2008]

Answer the question + IT Terms + Description + Detail + Social/Ethical Impacts+ Examples + Observation + Balance (Perspectives; Positives & Negatives) + Evidence from learning and research+ Conclusions / Opinions +

Answer the question + IT Terms + Description + Detail for command term + Positives & Negatives +

Answer the question + IT Terms + Description + Detail for command term +

Answer the question + IT Terms + Description + Detail for command term +

Answer the question

Identify
Provide an answer from a number of possibilities.

State
Give a specific name, value or other brief answer without explanation or calculation.

Calculate
Obtain a numerical answer showing the relevant stages in the working.

Outline
Give a brief account or summary.

Define
Give the precise meaning of a word, phrase, concept or physical quantity.

Describe
Give a detailed account.

Explain
Give a detailed account including **reasons or causes**.

Distinguish
Make clear the differences between two or more concepts or items.

Contrast
Give an account of the differences between two (or more) items or situations, referring to both (all) of them throughout.

Compare
Give an account of the similarities between two (or more) items or scenarios, referring to both (all) of them throughout.

Construct
Display information in a diagrammatic or logical form.

Analyze
Break down in order to bring out the essential elements or structure.

Discuss
Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.

To What Extent
Consider the merits or otherwise of an argument or concept. Opinions and conclusions should be presented clearly and supported with appropriate evidence and sound argument.

Evaluate
Make an appraisal by weighing up the strengths and limitations.

Justify
Give valid reasons or evidence to support an answer or conclusion.

Formulate (HL Paper 3 only)
Express precisely and systematically the relevant concept(s) or argument(s)

1 - 2 Marks	*2- 4 Marks*	*Up to 6 Marks*	*8 Marks (HL P3, Q4 – 12Marks)*
AO1		AO2	AO3

The areas of the programme and examination in which candidates appeared well prepared

Many candidates did very well on Section A, indicating that the basics are being well taught.

Some Section B questions were also handled very well.

Candidates who did very well had clearly done more than memorize definitions, lists of attributes and so on. Instead, they had a deep enough understanding of what they had learned so they could apply it to a new scenario very effectively.

Most candidates answered Question 5 and were able to apply generic issues associated with robots to the specific scenario.

The strengths and weaknesses of the candidates in the treatment of individual questions

Section A:

Question 1 (Google healthcare data):

(a)(i) Nearly all candidates were able to answer this question.

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(a)(ii) Nearly all candidates realized that data mining requires large quantities of data, but fewer were able to clearly identify the purpose.

(a)(iii) Few candidates had problems here.

(b) Candidates who provided reasons for each policy did very well.

(c) Many candidates veered away from the actual sharing of data to the advantages and disadvantages of the app itself. Some were able to tie this idea to the sharing of data.

Question 2 (Cell phone farmers):

(a)(i) Nearly all candidates scored two marks here.

(a)(ii) A number of candidates mentioned infrastructure which is not a direct cost, and many identified two items that were both hardware. That said, most candidates scored at least one mark here.

(a)(iii) Candidates who had a clear understanding of the difference between the web and the internet did very well. Many candidates showed a partial understanding.

(b) Surprisingly, a number of candidates were able to state advantages and disadvantages but not able to develop these comments with description and analysis.

(c) Most candidates could identify some advantages and disadvantages of each approach. The best candidates recommended investing in education and training first and the extending the functionality.

Question 3 (Sports photographs):

(a)(i) Nearly all candidates were able to identify two file formats.

(a)(ii) Nearly all candidates did very well.

(a)(iii) Most candidates could outline the differences between lossy and lossless compression.

(b) Most candidates were able to explain basically why the images had reduced resolution and watermarks. But many had difficulty developing these ideas.

(c) Candidates who directly address the issue raised by the question, the acceptability of taking photographs, posting them online and selling them, were generally able to provide arguments for and against these practices. The difficulty lay in developing these arguments.

Section B: all section B questions integrate Topics 3.10 and 3.11.

Question 4 (Route finding in Paris):

(a)(i) Most candidates were able to identify at least three and usually four factors.

(a)(ii) Most candidates were able to identify two examples of development personnel.

(b)(i) Nearly all students were able to answer this question accurately.

(b)(ii) Surprisingly, few candidates knew enough about agile development to devise a good answer. They may well have memorized the differences between waterfall and agile development, but, when asked specifically about one, they resorted to vague generalizations.

(c) This question was very difficult for candidates. Those who succeeded were able to find reasons for this decision and were able to clearly define fuzzy logic.

Question 5 (Meet Dennis, the restaurant robot):

(a)(i) Candidates had no difficulty with this question.

(a)(ii) There was a good range of sometimes very creative responses to this question.

(a)(iii) Most candidates did well.

(b)(i) Candidates who had clearly studied pattern recognition and pattern matching generally were able to earn at least one mark and often two, but had difficulty explaining well enough to earn a third mark.

(b)(ii) Surprisingly, few students had a clear idea of the nature of a Gantt chart.

(c) Most students did quite well on this question. There was a tendency to offer fairly generic arguments, but students did apply them to the specific scenario.

Question 6 (Use of expert systems in university admissions departments):

(a)(i) Most candidates were able to answer this question.

(a)(ii) Many candidates struggled with this question because they didn't have a clear understanding of constraints.

(a)(iii) Candidates who had clearly studied forward chaining and backward chaining had no difficulty with this question.

(b)(i) Most candidates could answer the question, but some had difficulty fully developing their ideas, so they did not obtain full marks.

(b)(ii) Nearly all candidates earned full marks here.

(c) Answers here were somewhat generic. Many students did not read the scenario carefully and did not address both the questionnaire and the video.

Recommendations and guidance for the teaching of future candidates

- Concepts should be taught in a specified scenario (context), so candidates can see how these concepts relate to real world conditions. Then, candidates should be presented with a new scenario (context) and asked to apply what they have learned to that new situation. This can be done by using current news articles from reliable sources and creating activities that require candidates to provide supported arguments and to evaluate the impacts of information technology on specific stakeholders. This will develop transferable skills, a critical requirement for a conceptually based subject such as ITGS.

- Candidates should keep a record of what is learned in class including copies/links to news articles discussed, notes on concepts which have been taught, copies of formative assessments and so. The format does not matter as long as the candidates have an organized body of material to review before the exam.
- Teach candidates how to read questions carefully especially the stem, so that they do not miss key elements or misinterpret the question entirely.
- Candidates need to be thoroughly familiar with the markbands and the command terms. This can be done by using them for formative assessments, having candidates use them to evaluate their own work and/or the work of other candidates, and applying them to samples such as those available in the TSM available from MyIB.
- Often textbooks, news articles, and websites do not provide clear substantive explanations of topics related to artificial intelligence and robotics. For teachers, the best sources for understanding the basic concepts are often, take a deep breath, books. MIT and Oxford Press each have a series of books that are very short (100-200 pages), low cost, basic introductions to a number of technological topics. Occasionally they can become a bit obtuse, but overall, they offer clear systematic explanations that are hard to extract from websites and article and develop concepts beyond the kind of comprehensive texts sometimes used in ITGS classes. They can be a good resource for teachers.
- An effective approach to teaching students how to develop an idea is to provide them with a sample answer to a part (c) question that is not developed (or a similar writing prompt), project that on a screen so the entire group can see it, and then as a group revise the text so that it reaches a proficient level (detailed knowledge, ITGS terms, well supported and balanced analysis). Follow up activities could include having pairs of students do the same process, exchange their work with another pair of students so that each pair marks the other pair's work. Then can then discuss the result or present it to the entire group. These kinds of activities can begin with simple paragraphs that develop one idea and progress to more complex arguments. Writing exercises should be incorporated throughout the entire course.

Standard level paper one

The areas of the programme and examination which appeared difficult for the candidates

Given the overlap between the HL and SL papers (three out of the four SL questions also appeared on the HL paper), the comments and suggestions detailed in the HL section also apply to the SL paper.

In terms of the SL-only question (Uber Taxis), the most notable issue was a lack of understanding of how GPS works from a surprisingly large number of candidates. Teachers need to ensure that students are actively taught the basics of how GPS works as intuitive guesses are almost certain to be wrong.

The areas of the programme and examination in which candidates appeared well prepared

The level of technical knowledge demonstrated across all four questions was generally secure and many candidates were able to answer most part (a) and (b) sections well.

The following comment appears in the HL section of this report but is worth reiterating here as it represents a key foundation of ITGS:

Candidates who did very well had clearly done more than memorize definitions, lists of attributes and so on. Instead, they had a deep enough understanding of what they had learned so they could apply it to a new scenario very effectively.

The strengths and weaknesses of the candidates in the treatment of individual questions

In this session there were three questions that were common to both papers. They were as follows:

Q1 - Google healthcare data

Q2 - Cell phone farmers

Q3 - Sports photographs

The comments for these common questions are included within Section A of the HL Paper 1 comments on specific questions.

Question 4 (Uber Taxis):

(a)(i) Many candidates were able to identify one plausible characteristic. Fewer were able to identify two. It appeared that a significant number of candidates had not addressed types of processing during their ITGS course and were guessing from the name "real-time".

(a)(ii) Some candidates were able to suggest at least 4 steps to gain full marks. A significant number of candidates erroneously claimed that the satellites calculated the position of the device and/or communicated with the device.

(b) Most candidates were able to answer this reasonably well although the nature of a feasibility study was less well-understood than a project schedule or user evaluation. Where candidates lost marks, it tended to be because their responses fell-short of "explanations".

(c) Most candidates found this question accessible and suggested a range of appropriate points.

Recommendations and guidance for the teaching of future candidates

These recommendations should be read in conjunction with the HL recommendations as many are applicable to both levels.

- As has been stated in previous reports, the links between the strands are as important as the content of each strand. Candidates must be taught that the inclusion of vocabulary and concepts from each strand must go beyond a simple "naming of parts" in order to access the upper markbands, particularly for part (c) and for "analyse" part (b) responses. For example, where a social/ethical issue and a related IT system are explained, candidates must also make it clear how and why that IT system causes, mitigates or has other implications for the issue. The ITGS triangle remains the key focus point and this should be highlighted throughout the ITGS course.
- Again, as has been stated in previous examiners' reports, teachers and candidates must be aware that while markschemes from past exams are a useful resource for teachers, they are not model answers and should not be treated as such, especially with respect to part (b) "analyse" questions and part (c) questions. Responses in the form of "advantage" and "disadvantage" tables are never appropriate for part (c) responses and strongly advised against for part (b) responses. Although points are generally presented on the markschemes in the form of bullet-point lists, this is for the clarity and convenience of examiners. Where candidates present their own responses as a series of purely descriptive bullet points they rarely score more than 2 or at the most 3 marks.

Higher and standard level paper two

General comments

The IT system in the article, a combined hotel digital key and booking system, was accessible to the candidates. Some of the more able candidates referred to their own experiences with a similar system or displayed familiarity with using hotels and booking systems. However, some of the Spanish candidates did not demonstrate such clear understanding/familiarity of online booking systems.

The Article contained a significant amount of material that candidates could use in order to overcome any personal 'disadvantage' that may be a result of having not travelling widely. The weaker candidates benefited from this source material in the Article.

Throughout the paper, the increased accessibility of the [digital keys] topic led to an increase in the marks for all criteria. More able candidates were able to apply their ITGS knowledge to the scenario, particularly in Criterion C. However, even though more content was presented, there was still a lack of analysis and evaluation in both Criterion C and Criterion D. This suggested many candidates were unable to make connections between the impacts and to use them to develop substantiated conclusions.

At the Grade Award meeting the boundaries for Grade 3, Grade 4 and Grade 7 were raised by one. This reflected the increase by one mark of the mean grade from that of November 2017 (which supported the assertion this paper was more accessible as the predicted grades for both cohorts had almost identical predicted grades).

This comment is made every session. The nature of the examination paper leads teachers, to a greater or lesser degree, to use a structured approach. It is most evident that teachers are preparing their candidates to adopt this structured approach when responding to Criterion C and Criterion D. It was also noticeable that candidates working in Spanish tend to focus more in social and ethical issues at the expense of technical knowledge.

The areas of the programme and examination which appeared difficult for the candidates

As with previous sessions, the higher mark bands for Criterion C and Criterion D were rarely entered. Unfortunately, many of the conclusions that were provided were often no more than a summary. Additionally, a number of candidates did not provide an in-depth analysis in Criterion C and Criterion D to enable a substantiated conclusion to be developed, as the concern or impact was only identified.

Some candidates seemed less well prepared for responding to Criterion A Part (b) and Criterion B Part (b) as they did not seem to understand the requirements of the questions.

The areas of the programme and examination in which candidates appeared well prepared

Although many candidates were unable to access the higher markbands in Criterion C and Criterion D it was most pleasing to see some responses in that contained significant content and were sufficiently developed enabling substantiated conclusions to be developed.

From the analysis of the candidature of this and previous sessions, it is observed that ITGS teachers in many of the schools working in Spanish appear to have a large number of candidates in each class. One technique to manage their workload and to be able to meet the needs of each student within their class, is to provide a boilerplate template for their students to use. This is particularly true for Criterion C and Criterion D. While it is fully appreciated that there are many advantages for using this templating approach, it can give weaker students the best possible chance of achieving a Grade 4, it can stifle the higher order thinking skills that are required to access the higher grades.

The strengths and weaknesses of the candidates in the treatment of individual questions

Criterion A

This question is meant to be an opportunity for the candidates to become engaged with the details of the Article and its theme. The material required in the responses usually comes directly from the Article and candidates who did not use the Article well lost marks that could have been easily obtained.

Part A

Generally, this question was usually done well, often with responses focusing on specific issues from the Article or the standard issues of privacy, reliability and security which were applicable to the Article. In Spanish some candidates identified one issue such as reliability but then also described privacy or security. Understanding, and being able to distinguish between, each of the social and ethical impacts is key to answering this part well.

Part B

This question is about the use of the ICT by the stakeholders. In this article there were not a large number of stakeholders involved which made it easier for the candidates to identify and relate them to the IT system. However, this session some candidates did not include the details in the ICT system but provided general descriptions or became side-tracked discussing impacts on a stakeholder. However, most candidates answered this question well basing their responses on the material in the Article.

Criterion B

Part A

Considering the limited space in the answer booklet, and the complexity of the IT system, it was not uncommon for candidates to use pages from an extra answer booklet for demonstrating their ICT knowledge. The purpose of the question is to provide an opportunity for the candidates to demonstrate their ICT knowledge and an understanding of how it is used in a specific context. The markscheme is looking for the candidate to move beyond and behind the steps in the article to develop them further. Very often the processes described in the article were just copied for 2 marks.

If a candidate knew their ICT well enough 4 marks were not hard to achieve through a substitution or addition of ICT to the description in the article. For example; data stored in the cloud becomes stored in a database in the cloud. Another one, the phone connects to the door and the code in the phone is used to open the door needed an expanded response to include some extra ICT such as connected through Bluetooth and a match of the phone code to the code in the doors memory or the hotel system database. A significant number of these developments were required to be awarded 4 marks, not just one or two.

Part B

The connection between the IT system and the concern needs to be clearly understood. This understanding enables the candidate to be able to explain why the concern can happen. Unfortunately, too often candidates provided more information about the concern, or its impact, but did not analyse the connection to the IT system. It is recommended that candidates attempt this question immediately after Q1(a), and then return to Q1(b) and Q2(a). The analysis needs to focus on the deficiencies of the polices, hardware, software, processes, etc. associated with the use of system, to explain WHY these deficiencies enable the negative impact/effects to happen. Many candidates only explained how the negatives could happen. An example of a good response: the use of the IT system meant that staff could be reduced as not as many were needed in the reception area, and hence the concern of loss of jobs by the staff as they would not be needed to welcome the guests and attend to their needs.

Criterion C

The more successful responses were structured on the various stakeholders as specified by the question, rather than an issue-based structure, such as privacy, security and digital divide. This enabled candidates to provide a balance of positive and negative impacts for each of two main stakeholders. A conclusion about the overall impact of the IT system (positive or negative) cannot be argued unless there is a balanced analysis of the impacts. The main word here is 'argue' not 'state' the conclusion. Too many candidates mistook a summary for an argument.

The positive and negative impacts were not difficult for candidates to describe and develop. Positives were clearly stated or implied in the article. The negatives could easily be inferred from the positives and if this link between them was explicit the candidate gained credit for analysis and evaluation. For example:

As there is less need for staff at the reception due to the system this meant that staff could be made redundant and at the same time this would save the hotel money; however, in the long term the less staff could have other impacts such as lack of service to the guests with a rise in complaints for the hotel.

Collection of data about occupancy and time of entering and leaving a room in a report for Daniel meant that guests might be concerned about their privacy and demand to know how the data would be used. Thus, creating a conflict between Daniel and the guests and implying that Daniel should have thought about this issue before implementing the new system.

Teachers need to provide practice for students to make direct connections between impacts using past Paper 2 articles and recent news items; and, to learn how to add extra evaluative comments. Without a balanced analysis and substantiated conclusions, a candidate cannot enter the top markband.

Unfortunately, a number of candidates who identified impacts but did not provide details describing and analysing the impact. Lists of impacts were common and limited the marks to the lower end of the mark range.

Criterion D

For this article the top of the middle band was more easily achieved as there were solutions and ideas the students could easily apply to the digital keys scenario. Additionally, the solution was easier to describe and apply as it could be non-technical.

For this criterion candidates need to describe a solution to at least **one** of the problems found in Criterion C, but some candidates did not provide a detailed description of the solution, especially technical details (who, where, when, what, how) or details of policies, laws or procedures that are needed for it to be implemented. Textbook type solutions received low marks if not connected to the article, e.g. a description of encryption or security measure such as passwords and biometrics with lack of application to the specifics of the article and the problem. Also, the old problem of a candidate providing more than one solution was still present; **only the first solution is marked as specified by the question**.

In the second half of the response the candidates need to provide a balanced analysis of the effectiveness of the solution. This may go beyond the solving the immediate problem. These could include consequential impacts of the solution on other problems, stakeholders, long and short-term benefits, costs, etc. These need to be included in the conclusion which argues whether the solution was effective in solving the problem. Also, in the conclusion candidates can provide future developments that could improve the solution by mitigating some of its potentially negative impacts.

Recommendations and guidance for the teaching of future candidates

- There needs to be the focus of teaching from the beginning of the course and there are enough past Paper 2's and current news items to practice on. Also, teachers need to

develop exemplar responses linked to the requirements of the markbands for each criterion from past Paper 2's and to encourage candidates to develop their own exemplars.

- Another important aspect while working on past papers is to emphasize the meaning and implication of each social and ethical issue and to work to find solutions to "solve" each of them.
- Ensure that only **one** solution is provided for Criterion D.

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Higher level paper three

General comments

The topic of the case study was clearly accessible to many of the students who had engaged in researching AI in general, whether it was through AI toys, smart home devices or cars. It was clear from reading the responses that a number of schools had conducted surveys to find out opinions and attitudes towards AI dolls, purchased the AI toys to be able to further investigate them and conducted a wide range of research on the Internet, discussing how they are being used or through news articles discussing some of the issues. Question 4 allowed students to be rewarded for their research.

The areas of the programme and examination which appeared difficult for the candidates

Students did not always correctly identify measures required to keep the data on the doll secure, but instead focused on the transmission of data or security in the cloud.

A few students did not fully understand the term 'accountability', which impacted their ability to answer Question 3.

The Case Study introduced the terms, technological singularity and uncanny valley. These were often mentioned by students, but not always correctly in a well-supported argument.

The areas of the programme and examination in which candidates appeared well prepared

Students were able to identify information that would be sent to the cloud and identify steps in security.

Students seemed better prepared to analyse the ethical issues arising out of Alicia, from the analysis of the responsibility of the different stakeholders, to the idea of replacing friends with an AI doll. More of a balance of arguments were developed as part of the analysis.

The strengths and weaknesses of the candidates in the treatment of individual questions

Question 1

(a) There was a wide range of acceptable answers for this question, and many students identified explicit pieces of information that could be sent to the cloud. Weaker students provided general responses e.g. behaviour or interactions.

(b) This was an accessible question for most students. A range of methods were identified by students, the most common being usernames and passwords. Some students did not focus on the 'accessing of the data' and therefore did not score well if they took this approach.

Students should be advised that when asked for two, only two answers should be given.

Question 2

(a) The response to this question was varied. Many students were able to identify a method correctly such as encryption but did not provide a sufficient development for the second mark. Other students did not focus on the method used for the storage of data 'on the doll' and focused on the transmission of this data, which was not what the question was asking.

(b) Most students were able to provide a reason for the doll pausing before giving a response and provide a limited technical explanation. Those who provided more technical steps, achieved higher marks in this question with the more able students using correct terminology in their explanations.

Question 3

Performance in this question varied, with the majority of students being able to present one argument that supports MAGS being responsible and one argument for the parents. Only some students extended beyond MAGS and parents to a third party, either a hacker, babysitter or the Government. The more able students were able to link the responsibilities of the different stakeholders and their actions to how it might cause harm, or damage property, as well as make evaluations and judgements throughout the response.

Question 4

Most candidates were able to discuss whether it was acceptable for AI toys to replace friendships. The more able students were able to give a number of reasons backed up by relevant independent research and draw conclusions from this. The weaker students provided one sided arguments or focused on the technological developments of the doll, rather than the issue of the friend replacement being acceptable.

Recommendations and guidance for the teaching of future candidates

- Students should take further notice of the additional words listed at the end of the Case Study and make sure that these terms are fully understood.
- Read the question carefully: Further guidelines should be provided for students to focus on the wording of the question, so that the question is answered specifically and not just based on the topic of the question. E.g. Many students misread question 2(a) focusing on how the data could be secured and not considering 'on Alicia'.
- Command Terms: Further guidance should be given to students on how to structure answers based on the command terms of the question.
- More explicit linking of Independent Research (IR): Students when using IR should be working to explicitly link this research back to the point or argument being made so that

it effectively supports the point being made. It is not adequate to just mention the brand names of AI toys or smart home devices.

- Developing a conclusion: Developing student's evaluative comments and conclusions should still be a focus for teachers. Ensuring that the conclusion is more than a summary of the comments made or an unsupported judgement. Instead, includes judgements that are supported by the arguments, that may be based on a long or short-term benefit, or based on how many people would be affected.