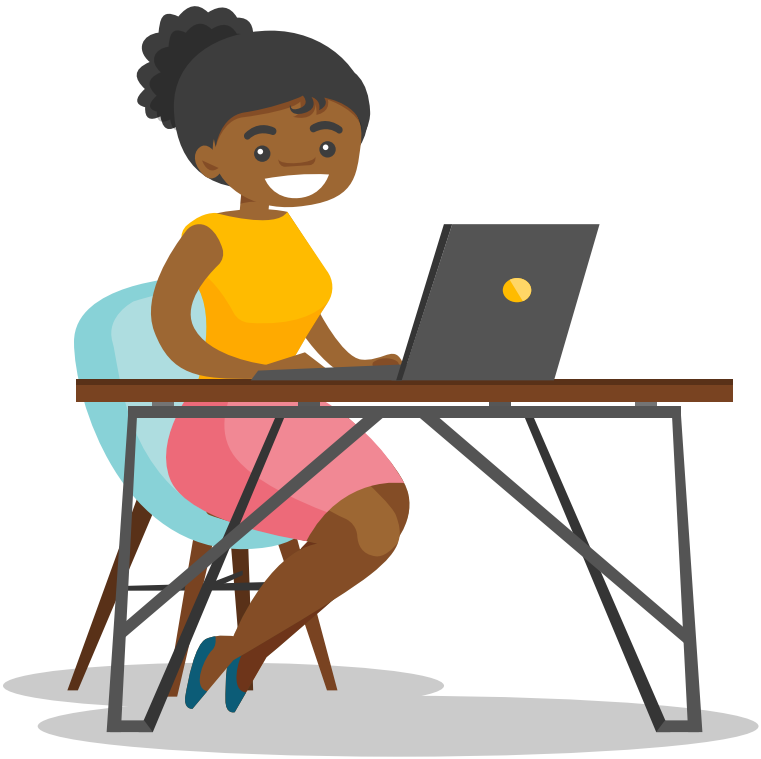
Digital Media Literacy and Cognitive Development



Media Smarts

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HANDOUT

DIGITAL MEDIA LITERACY AND COGNITIVE DEVELOPMENT

Psychologist Jean Piaget identified four stages in the development of thinking: sensorimotor, preoperational, concrete operations and formal operations. Though recent research has found these categories are less fixed than Piaget's theory suggested, they remain a useful rule of thumb when thinking about how to teach digital media literacy.[1]

Sensorimotor (birth to two years): Thinking is limited to the child's body and environment. Only towards the end of this stage are children able to think at all in a symbolic or abstract way. As they reach the end of this period, they become more aware of social norms relating to gender and other physical traits such as skin colour, and begin to be more strongly influenced by parental and media stereotypes.[2]

Over this period, children begin to understand emotional reactions as something they feel and which can be controlled. Help them to identify their emotional states and provide them with a vocabulary for talking about feelings.[3]

Children this age have little or no understanding of the separation between media and reality: for instance, "when asked whether a bowl of popcorn shown on a television would spill if the TV were turned upside down, many 3-year-olds said yes."[4] Towards the end of this period (18-24 months) they begin to recognize their reflection in a mirror as being themselves.[5]

During this period it is best to avoid screen media as much as possible,[6] including purportedly "educational" media (from which children this age get no benefit.)[7] If kids do watch or use screen media, follow it up by talking about the content with them or by reading a book, singing a song, playing a "make-believe" game, or otherwise engaging them on the same subject.[8]

When reading books, listening to music, or attending live performance, encourage children to ask questions and to share their opinions and reactions. "Model asking literacy questions, but don't expect answers."[9] Select books that allow them to identify familiar things such as children, cars, pets, and so on. [10]While e-books are better than no books at all, the preference should be for physical books: "chewing a book is the child's first interaction with it. Eventually, there will be interest in the pictures and the words."[11]

By the end of this stage, they begin to be able to play with other children (rather than alongside them in the "parallel play" common among toddlers) and can begin to follow simple game rules or habits like asking "please" or "excuse me."[12]

Children under two don't get any benefit from screens, even shows or apps that claim to be educational. Time with screens also takes away from the things they do need, like interacting with other people and exploring the world around them. The exception is screen activities that are shared with family members – like video-chatting with grandparents or reading an e-book together.[13]

That doesn't mean that it'll do your kids any harm if they watch a few videos every now and then while you're chopping vegetables – but you make sure that doesn't become a habit. It's especially important not

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to use screens to soothe or settle kids: this can make it harder for them to learn to regulate their own moods.[14]

Preoperational (roughly two to six years): At this stage children can think symbolically, but still do so through sensory representations such as images. They have difficulty making or analyzing formal arguments or taking others' point of view. However, they can be prompted to think critically by intentionally provoking disfluency. Ask them questions that are likely to lead to broad assumptions or generalizations, such as "are summer and winter different?", and then give them evidence that shows the generalization is wrong.[15]

Children at this stage generally assume that things can happen by random chance rather than intention.[16] (People in later stages can also fall prey to this misconception, a hallmark of conspiracy thinking, believing that "big events must have big causes" or that those who benefit from an event must necessarily have caused it.) Preoperational children however, learn to test hypotheses if they're given hands-on ways of doing so. For instance, they can be asked to test the idea that "round things bounce" and given a box of objects that could be used to test it – round things that bounce like rubber balls, not-round things that bounce like springs, and round things that don't bounce like wooden balls.

> At the beginning of this stage, the activity should be teacher-led and done together with students: the teacher names the traits of the object ("this is round") and the students test the hypothesis by seeing if it bounces or not.
>
> Older students can be given more freedom to "play around" in testing the hypothesis, it's important for the reasoning strategies that were used to be explicitly identified and explained, and for students to be given a chance to transfer the same strategies to testing a different hypothesis soon afterwards.
>
> Towards the end of this stage you can also include some objects that will provide no information about the hypothesis, so that identifying which are relevant becomes part of the exercise.[17]

Children at this age are already prone to bias: they favour an unreliable source that is biased towards their group over a more accurate one that favors an out-group.[18] They are better able than younger children at identifying what emotion another person is feeling, and now recognize that someone's emotional state is not always a direct reflection of reality,[19] but tend to imagine people as feeling only a single emotion at a time.[20]

At the beginning of this stage, they have difficulty with the idea of a narrator, and are likely to identify whoever is reading the story, or the most prominent character, as the narrator.[21] They are also likely to be overly skeptical of things that merely seem unlikely, such as the idea that someone could have a pet zebra, while being trusting of things said by sources they trust.[22]

Throughout this stage, children can identify similarities or differences, including comparing media representations and their own lives. Examples should be as concrete as possible. For example, you might ask "The horses in the cartoon are blue and purple. But you've seen people riding real horses. What colors were those horses? … If you made this cartoon, what color would you make the horses?" By the end of this stage, children can begin to make generalizations

about media makers' choices and intentions, such as identifying what makes someone "beautiful" in an illustration of *Cinderella* or comparing the roles played by male and female characters in fairy tales.[23]

Over the course of this stage, children become better able to answer questions about media. By around three or four, they will be able to draw on some obvious features of media works; by age six they should be able to think about who made a media work, but not yet analyze their choices in making it.[24]

Between three and about ten, kids can benefit a lot from media experiences that:

- involve **active** thinking and **open-ended play**, instead of just drills and quizzes;
- **engage** them in the activity without unnecessary distractions or bells and whistles;
- provide **meaningful** content and activities that are relevant to their lives and interests; and
- encourage **co-viewing and interaction with family members** or other people they already know offline.

KEY SKILLS TO DEVELOP:

ACCESS:

- Begin to explore strategies for finding credible information
- Find and select media for their needs
- Use media information sources to solve a problem
- Seek help with access challenges

USE:

- Begin to experiment and play with media tools in a safe environment
- Play closed- and open-ended media-related games, collaboratively or competitively
- With support, begin to use media tools to make functional and creative works
- With support, assign group responsibilities while making media
- Communicate using digital tools, including using non-text media
- List times and purposes for using different media tools
- Answer questions from adults or other children about media works they created

UNDERSTAND:

- Identify the narrator or viewpoint character of a media work
- Identify the maker(s) of a media work
- Identify and explore the roles and responsibilities of media makers
- Recognize the basic rules of notice of simple media forms they encounter frequently, such as food packages
- Recognize advertising as a genre
- Identify choices made by the makers of a media work and speculate on the reasons behind them
- Identify the purpose of a media work or tool
- Explore alternate uses of a media tool
- Describe their choices when making media

- Ask relevant questions about information in media
- List and explain strategies for managing conflict online
- Articulate rules for online behaviour and engagement
- Predict the consequences of online actions
- Identify the different purposes for which makers (both amateur and professional) create media

ENGAGE:

- Talk about why they like or dislike media works
- Explore their personal and emotional responses to a media work
- Create a response to a work that shows a different point of view
- Engage in creative play or make media using characters and events from favourite media works
- Explore how people and places are represented in media
- Make judgments about how similar a work is to reality as they know it
- Identify liked and disliked characters in media works and list what they like about them
- Make comparisons between characters in media works and themselves
- Identify safety resources and help-seeking strategies
- Begin to develop an identity as an online citizen

Concrete operations (roughly seven to eleven years):

"Between early and middle childhood, children shift from believing that all reality is directly knowable and that there is only one right answer to everything that everyone should have (e.g., not recognizing that others can hold beliefs that are false) to recognizing that people can hold beliefs that are false."[25] Over the course of this stage, "children are increasingly able to collect, organize and integrate information and ideas from various sources. In addition, they are learning to question and predict, examine and analyze opinions, identify values and issues, detect bias and distinguish between alternatives."[26]

Children develop their capacity for abstract thinking over this period.[27] They become interested in logic and abstractions such as "justice" and come to understand that characteristics can be relative (for instance, something might be the biggest in one group but not in another.)[28] They also move from conceptualizing the mind as an empty vessel to be "filled" with information to viewing learning as an active process.[29] They still have difficulty with abstraction, however, and while they "can be taught to memorize and repeat abstract concepts, they most likely will not understand them on a deep level."[30]

They can now make deductive and inductive arguments, but they are mostly only able to reason based on things they already know or have experienced: they can test hypotheses but generally can't use inductive reasoning to make new hypotheses. They are able to discuss problem-solving, scientific investigation, parliamentary procedures and conflict-resolution techniques in a fairly sophisticated way, but still do not critically engage with content without direct prompting.[31]

By around age six, children can understand that the source of a claim affects the claim's reliability: sources with first-hand knowledge, expertise, or a history of honesty are seen as more reliable, and vice-versa. However, only towards the end of this stage do

children become able to understand that the purpose for which a media work was created can influence its *bias* or *reliability*.[32] They understand the difference between original and intermediary sources, but are still learning how to weigh them and to pay more attention to the reliability of the original source.[33]

They develop the ability to distinguish between fact and opinion[34] over this stage and also begin to understand that *other* people may not understand something the way *they* intended.[35] For instance, they might consider questions like:

- How would an experience be different for someone else?
- How might someone else interpret things differently?[36]

However, these must be concrete rather than abstract, so they might be asked to imagine how a *particular* person or character or a person with a *particular* different perspective might see or experience something differently. These can also start with concrete differences such as size (e.g. How would your day be different if you were only a foot tall?)

They can also start to develop an *evaluativist* perspective, recognizing that while people may have different perspectives, some may be "more right than the others based on evidence and logic."[37] Towards the end of this stage, around ten, is also the earliest age at which efforts to specifically foster intellectual humility have been shown to be effective.[38]

Over the course of this stage children also develop the ability to recognize and understand sarcasm and irony.[39] Children at the beginning of this stage are most likely to be engaged by talking about their personal experiences, whereas by the end they prefer to talk about factual knowledge.[40]

Another major development is the ability to see from others' points of view: "by seven or eight years of age, children can explain how two people might come to different interpretations of an ambiguous drawing or sentence."[41] Children at this stage will consider other people's beliefs or preferences when making arguments (for example, emphasizing that a snack has chocolate if they know a person likes chocolate, or that it has nuts if they know they like those.[42])

As a result, at this age children are starting to become consciously aware of others' bias, and how it may affect their reliability: they are more likely to believe statements that are against the source's self-interest, for instance. However, at this age children are more likely to look to peers' opinions, either explicitly or indirectly (such as by looking at the comments section of a video before deciding whether or not to trust it.)[43]

They are developing theory-of-mind and metacognition, but at very early stages. They tend to overestimate their own knowledge.[44] They can recognize that what is appropriate behaviour is different in different circumstances and come to understand that other people may believe things that the child knows are not true.

Children at this age are more attuned to fairness and equality. They enjoy things with clear rules; board and strategy games are very appealing.[45] They are gaining in their ability to manage their thinking and their emotions and to navigate more complex relationships. However, the need to fit in with the group is also becoming stronger. [46] They understand and respond to simple morals in media works, but more complex messages can be misunderstood. They give more weight to the behaviours that they see more often (for instance, if a character engages in a negative behaviour for most of a program and only behaves positively at the end.) However, a short explanation that makes the message or moral explicit makes up

the gap.[47]

Critical thinking is possible if **scaffolded** with concrete questions, such as:

- What jumped out at you when you were watching (playing, listening, etc.)?
- What did it make you feel?
- What do you think produced that feeling?[48]

In the same way, children's discussion of abstract ideas needs to be scaffolded by taking a step-by-step approach: first answering concrete, fact-based questions (e.g. "What did this character do?"; then using these as a way to consider questions involving some degree of personal judgment, but still tied to specifics (e.g. "Would you call what they did stealing?"); and only then moving to the most abstract questions (e.g. "In what cases could stealing be justified?").[49]

Children at this age can also achieve *mature concepts* through a guided negotiation of *scientific concepts* and their *everyday* concepts. For example, discussing the everyday practice of brushing teeth and explaining the need to brush away decay-causing agents can produce the mature concept that consistent tooth-brushing is important to protect teeth. In media terms, this involves having students elucidate their everyday understandings of media tools and merging them with essential understandings of those tools.[50]

They develop the ability to understand the difference between fantasy and reality. However, while they generally accurately identify clearly unreal texts (such as cartoons) and texts that are meant to be taken as real (such as news) they are less sure about more realistic works that don't have obvious cues of artificiality. (For instance, early in this stage they may assume an actor is essentially the same person as the character they play.[51] By the end, they can generally distinguish between works that are meant to represent reality and those that are unreal: "for instance, most 11-year-olds know that an actor who plays a police officer does not occupy that role in real life."[52] They often do not understand that media works are prepared and rehearsed, imagining them as simply capturing performers' unprompted actions, especially at the early end of this range. However, the youngest children of this age are more likely to see *all* media as unreal, not understanding the nature of news or documentary.[53]

They begin to be able to identify "basic elements of media storytelling and meaning-making"[54] and can understand differences between genres.[55] However, it is only around age 7 or 8 that they can speculate on the *intent* of a media maker.[56] This is also the stage where they are able to recognize and understand media conventions such as dissolves, flashbacks, dream sequences and point-of-view filming,[57] and they can now recognize that people may feel more than one emotion at once in a particular situation.[58] It's best at this stage to scaffold students' media analysis by having them focus on a single "channel" at a time: image, editing, music, et cetera – rather than considering them all at once.[59]

At the beginning of this stage, it is more productive to teach children to recognize advertising as a *genre* and how media industries make money:[60] only towards the middle or even end of the stage does it become effective to make them aware of ads' persuasive

intent.[61] Towards the end of this stage they also can begin to understand cognitive biases, though they still have trouble identifying them in their own thinking. [62]

At this age children's understanding of the internet is 'bounded': they see it as discrete individual tools rather than a connected system.[63] Children at beginning of this stage do not recognize the networked nature of the internet. They see apps and websites as discrete, unconnected tools. They are unaware of online tracking and personalization.[64]

Most children at this age never go beyond the first page of results during a search[65] and are not aware that their searches or actions online are visible to others or contribute to how content is targeted to them. Similarly, they do not know how searches or content is curated or delivered. They can begin to identify journalism genres, recognize newspaper structure and sections, understand the newsroom organization (who does what, deadlines, daily routine), be familiar with basic journalistic standards.[66]

Children this age do not generally know that apps have been designed to maximize use and engagement. They have a limited ability to think consciously about the technology use and interrupt "tech tantrums, reward loops and auto-plays."[67]

By around age seven or eight, they are able to write two correct sentences on a topic; by nine or ten they can begin to write longer pieces. The gap between oral language and reading/writing narrows over this stage, but may be as much as three years at the beginning.[68]

This is also a stage where children begin communicating more with offline friends through digital means such as instant messaging, but they need to explicitly learn and practice how to deal with the absence of emotional cues in that medium. Digital parenting expert Devorah Heitner suggests asking questions such as:

- What would you do if you're on a group text and someone says they want to restart the group text without you?
- What will you do if someone says something mean about a teacher or another friend?
- What could you say to a friend who is texting you too much, and you need a break?[69]

With scaffolding and support (such as teacher modeling) they are able to begin to understand that apps, websites, games, etc. are networked media[70] and can begin to meaningfully learn about copyright and fair dealing, as this is a time when ethical use of online content becomes increasingly relevant as they are beginning to use the internet for school research projects.[71] They are starting to understand the risks of sharing information online,[72] but are still generally trusting of how others will respect their privacy.[73] Explicit rules and routines are still needed to ensure they take steps to protect their personal and data privacy.[74] "Privacy" is still conceptualized in very concrete terms (phone number, address, etc.) Online gaming and personal hobbies, along with social media, increase the risks of stranger contact.

Because this is the period where the biggest leaps occur in children's ability to think critically, it is essential to:

- Encourage students to ask and discuss questions;
- Help them to understand that failure is a necessary

step to learning, improvement and discovery;

- Prompt them and provide scaffolding to reflect on their own thinking;
- Ask them questions and provide them with material that lets them experience new perspectives.[75]

KEY SKILLS TO DEVELOP:

ACCESS:

- Assess and use sources of information
- Develop multiple strategies for finding credible information
- Identify the best ways of finding information
- With support, identify and use assistive technology
- Find appropriate media for school and personal needs
- Follow ethical rules when accessing and using media

USE:

- Select appropriate tools for their needs and purpose
- Identify and manage risk when using media tools
- List sources of help
- Follow ethical rules when using media for school or personal work
- Select privacy settings on apps and platforms
- Use privacy tools and habits to minimize data collection
- Develop conscious strategies for avoiding, minimizing, and resolving conflict online (e.g. recognizing empathy traps, explicit communication through tools such as emojis)
- Identify what they are feeling when using media
- Self-manage emotional responses when communicating online
- Create creative and informational media texts in a particular genre

UNDERSTAND:

- Recognize the rules of notice of media forms they're familiar with and identify their impact (e.g. the use of music to create suspense)
- Speculate about media makers' reasons for using different techniques
- Identify and explain the impact of media tool affordances
- Explain the impact of connections in networked media
- Describe how networked communication can affect empathy, personal interaction, etc.
- Identify facts and opinions and the differences between them
- Identify point of view in a media work and consider its implications
- Identify and analyze the ways in which attractiveness is socially constructed
- Create a media work that shows understanding of a genre
- Create a media work with a persuasive goal
- Analyze a work to speculate on the purpose of different elements
- Evaluate the usefulness and reliability of online information by considering motivation, process and expertise

ENGAGE:

- With support, ask critical questions of media works
- With support, identify patterns in media representation
- Identify how a media work makes money
- Use facts in an argument to effectively support an opinion
- With support, identify how media works are framed and consider the impact of that framing
- Analyze the role of media technologies in one's own life
- Recognize and identify emotional persuasion techniques, including advertising
- Predict the impact of one's actions when using media tools
- Begin to use media tools for self-expression or civic engagement
- Share media resources with others
- Practice strategies for making a positive intervention in online environments
- Act as media mentors to younger children

Formal operations (transition begins at roughly twelve years and continues through the teens):

At this age children should be able to develop their own hypotheses based on observation and to think consciously about their own thinking. "Formal operational children can reflect on knowledge they already possess and, without needing additional information from the external environment, arrive at a previously unknown truth."[76]

While children and teens still need support and scaffolding, they "they can engage in sophisticated epistemic cognition, such as creating effective criteria for evaluating different scientific models, and choosing the best among them."[77]

At this stage, children can become more conscious of their own thinking and think more systematically about biases and thinking shortcuts.[78]

As they get older, children actually endorse critical thinking more strongly, and by their teens are generally strongly in support of intellectual humility.[79]

It is at this age that children's reasoning is most likely to lead them to take positions on issues that differ from their teachers' or parents'. It's important to respect those so long as they have come to them through critical thinking and reasoned argument.[80]

At the beginning of this stage, children are often becoming more interested in the wider world and may use media to learn about current issue or events. At the same time they see less value in many school subjects. They are more likely to value activities that are connected with long-term goals. Peer pressure, especially related to gender expectations, has a stronger influence.[81]

Children in this stage have an increased capacity for self-awareness and empathy. They are more "self-starting" and will start things without adult prompting. They are often interested in sarcasm, wordplay, and current peer language.[82] Their ability to see multiple sides of an argument has improved significantly and

they can brainstorm multiple solutions to a problem. There is an increasing awareness of the subjectivity of knowledge and that different viewpoints may be valid, but this is offset towards a tendency towards idealism and polarized thinking. This tension is often resolved by a sense that subjectivity only applies in some disciplines or contexts but not others. As a result they may have difficulty seeing multiple perspectives in interpersonal conflicts.[83]

At the beginning of this stage they still typically have little knowledge of how digital tools such as search engines work, e.g. imagining Google as a human resource (either a staff answering questions or a network similar to Quora) rather than an algorithm. As a result they rely too much on surface cues such as the order of results to judge reliability.[84]

They have little knowledge of what platforms do with the content they post there and the data gathered about them. They are increasingly aware of the difference between the idealized images they see in media and their own reality, but do not generally have strategies to resolve this conflict in a healthy way. They are aware of online risks such as privacy invasions and stranger contact but more often in the abstract sense, having been told of them by teachers or parents rather than peers. This often leads to a disconnect between their sense of risk and their actual everyday practice, such as recognizing (and often overstating) reliability concerns with Wikipedia but using it anyway.[85]

Youth at this stage typically see the online world as a personal space which they use for self-expression, socializing and self-directed learning. They are able to weigh risks and opportunities but give more weight to possible benefits. They are becoming aware of the most abstract traces they leave online, such as location tracking and data collection, but generally do not yet understand their possible future consequences.[86] Even well into the teen years, children still typically have a poor understanding of corporate data collection and its implications, as well as the long "shadow" that their online presence may cast.[87]

At this stage children are very conscious of the need to create a specific digital image, carefully choosing (and sometimes editing) photos to that effect. They rely on peer feedback in this. Though they are aware of the artificiality of this practice, they are more likely to use alternate or private accounts for a more authentic experience rather than using their main accounts in more authentic ways. Children this age still conceptualize privacy largely in interpersonal terms. They are beginning to conceptualize non-immediate audiences for what they post online.[88]

By the middle teen years, children's peer groups are more settled and they are more influenced by their peers than adults. They are frequently starting to form romantic relationships. Their morality is becoming more personal and based on values rather than rules or norms, and they can learn to articulate their values and ethics.[89]

Two important ideas relating to teens are the *imaginary audience* and the *personal fable*. The imaginary audience is the result of their still-developing perspective-taking abilities, which lead them to overestimate how much attention other people are paying to them. This makes them more self-conscious and leads them to think of privacy primarily in terms of *impression management* – trying to control how others see them.[90]

The personal fable is an implication of belief in the imaginary audience that leads teens to also overestimate their "specialness" and the uniqueness of their place in the world. It contributes to their tendency to overestimate the rewards of an action and underestimate the possible costs. Related to this is the optimistic bias, which leads many to believe that bad things will simply not happen to them. (This is also found among adults, but is more common and stronger among teens.) As a result they are poor at judging risks, especially when they are with other teens. Research has found that teens often exhibit optimistic bias with regards to online risks such as cyberbullying.[91]

For this reason, risk messages should focus on consequences that seem probable and directly relevant. British neuroscientist Sarah-Jayne Blakemore gives as an example warning teens that smoking "give[s] you bad breath, or put[s] younger children in danger." As they feel strongly about their newfound independence they "also respond to the idea that this is an adult industry that is exploiting them to make money."[92]

Jane Brown's *Media Practice Model* proposes a cycle in which teens' own preferences and identities lead them to *select* and *interact* with particular media works. They then *apply* these media works to their views of themselves and the world, possibly copying or rejecting what they have seen (though these are not the only forms of application.) This leads to a further development of their identity, which further prompts selection of media works, and so on.[93]

LEARNING GOALS:

ACCESS

- Navigate between platforms and devices
- Explain and act on ethical issues when accessing and creating digital content
- Understand Fair Dealing rights and use media content accordingly
- Filter out irrelevant information and search results
- Find reliable information on physical, mental and sexual health
- Reflect on their and others' information ecosystems

USE

- Manage risk to balance it with opportunity
- Identify sources of help
- Develop multiple possible solutions for online problems
- Develop plans and strategies for balancing media use
- Prioritize between different uses of media, including minimizing those that have a negative impact on well-being and prioritizing those with a positive impact
- Anticipate possible consequences of actions using media tools
- Identify digital "footprint" and predict digital "shadows" of data collection and algorithmic decision-making
- Create sophisticated media works

- Predict and mitigate the possible risks of sharing content online

UNDERSTAND

- Explain the impact of rules of notice on their experience of a media text
- Analyze the ways in which media tools influence how they are used
- Identify and compare possible motivations behind the creation of a media work
- Analyze the impact of genre and industry practices on issues such as bias, diversity representation, et cetera
- Explain the methods and purposes of online data collection
- Describe what consent means in a media context
- Resolve conflicts in online settings
- Identify media features and practices that contribute positively or negatively to well-being Identify and describe others' emotions and motivations in online settings
- Take steps to manage the collection of their personal information online
- Use strategies to manage health impacts of using media technology
- Work collaboratively with others using media tools

ENGAGE

- Independently ask critical questions of media works
- Analyze the role of media technologies in a community or society
- Independently identify patterns in media representation
- Identify how media works are framed and analyze the impact of that framing
- Recognize techniques used to promote polarization, othering and dehumanization
- Identify and regulate their own emotions in online settings
- Take active steps to promote positive social norms and values
- Connect the meaning of media texts to their own lives
- Describe others' perspectives when interacting through media
- Explore moral dilemmas in media use
- Take an active role in shaping the norms and values of their online communities
- Develop strategies for engaging in active citizenship using digital tools

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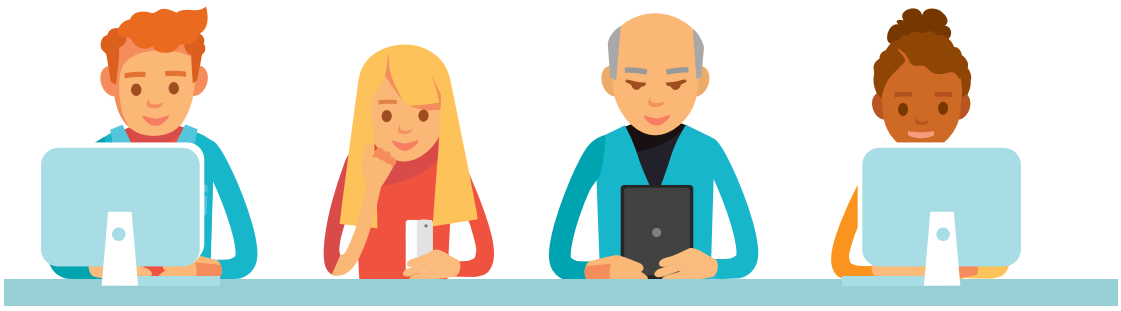

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