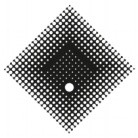

Educational data brokers: using the walkthrough method to identify data brokering by edtech platforms

Educational data brokers: Using the walkthrough method to identify data brokering by edtech platforms.

Abstract: As a result of the growing commercial marketplace for teacher and student information, a new organization that includes educational data brokers has evolved. Relatively intangible due to the ease of de-identified data being collected and sold via educational technology, there is an urgent need to expose how brokerage of educational data relates to the commercial mediation of consent and privacy in educational settings, as it is made difficult due to a lack of consistent terminology about organizations that buy and sell data. Using the Walkthrough Method, the edtech platform Edmodo analysis is completed. This paper reports on the findings of this analysis to provide empirical evidence that justifies the term educational data broker. The results aim to provide new terminology to a largely obfuscated process in educational settings and bring to light a concrete example of brokerage activity in educational settings.

Keywords: Educational data broker, Walkthrough method, Edmodo, Consent, Privacy

Word Count: 7343/8308

Introduction: As educational data has value, we have educational data brokers

There is a commercial marketplace for teacher and student information. The edtech market includes multiple tools from dashboards to applications, platforms, learning management systems, search engines, tracking tools (such as bus routes), and various other technologies. However, educators and students are using edtech without understanding how their data is collected and sold. The educational data market is profitable, expansive, and largely unknown (Russell, Reidenberg et al. 2018). The market is built on the premise that information obtained from educational settings can be de-identified and exploited without restraint and driven by data extraction, aggregation, analysis, and meaning-making for profit (Komljenovic 2021). Thus the brokering of educational data has emerged as a profitable endeavour. Various authors have explored the marketplace in notions such as digital capitalism (Sadowski 2019), platform capitalism (Srnicek 2017), assetization (Birch, Chiappetta et al. 2020), servitization (Arantes 2020), and education rentiers (Komljenovic 2021). These authors make clear the value of teacher and student information.

This is particular importance as part, as according to Lupton (2021) teachers are not considering the ways data can be exploited by third parties. Particularly given the broad spectrum of issues and that the size and scope of such issues is increasingly being managed through legislative processes (Swant, 2022). The educational technology (edtech) marketplace is predicted to be valued at $370-$410bn by 2025 (IBIS Capital 2020), and the potential and actual implications of commercial activity in educational systems have received the attention of critical researchers (Selwyn 2020, Williamson and Hogan 2020, Moore, Jayme et al. 2021). However, the literature is largely missing a term to represent the intangible organizations that buy and sell teacher and student information, according to the logics of the edtech marketplace (Perrotta, Gulson et al. 2020). If left without definition, a critical gap in discussing the value of educational data are lacking and teachers are arguably left vulnerable to criticism.

Using the 'Walkthrough Method' (Light, Burgess et al. 2018), this paper reports on an analysis of the educational platform, Edmodo (www.edmodo.com), to demonstrate the presence of data brokering. The Walkthrough was chosen as methodological approach to analyse what is often a messy and complex reality of the world in which education exisits. The analysis was completed in 2019 as part of the author's PhD (BLINDED). It reports findings that analyze six months associated with Edmodo being acquired by gaming giant Netdragon. It begins by describing the Edmodo platform, followed by a brief outline of the method used to perform the analysis. The findings are then reported according to three broad areas. Firstly, the Environment of Expected Use discusses Edmodo's vision, operating system, and governance structures. Here, the paper demonstrates how brokering activities can be understood in new policy statements and communication of visions before and after acquisition.

Secondly, the Technical Walkthrough analyses the registration processes, everyday use, and leaving the app regarding data collection and usage. This section details how the platform's design captures data through self-categorization.

Thirdly, Unexpected Practices draws on the findings to illuminate not otherwise identified conclusions resulting from the walkthrough. Here, the paper draws on the Australian Competition and Consumer Commission (ACCC 2019) findings to actualize educational data brokerage as a pragmatic and profitable business model.

I argue that data collected in and around educational settings is being sold by educational data brokers, enabling teachers and students to be profiled in ways that we cannot control but significantly impact our future events. This article is largely empirical. It aims to draw on data to demonstrate the presence of *educational data brokers*. This paper's contribution to knowledge is novel and reflects the reality of educational data brokering via an examination of the educational technology platform, Edmodo. First, doing so provides new terminology to a largely obfuscated process in educational settings. Secondly, illustrates how the Walkthrough method can be utilised to demonstrate what educational brokering looks like in practice. By using the researcher's examination of educational platform, Edmodo, researchers, policymakers and educators are offered a template for critiquing brokering practices elsewhere in the edtech sphere. The research question loosely guides the paper, "How might the walkthrough method be used to identify if brokering may be occurring in the edtech platforms teachers use?" This study examines various expected uses (operating model, governance, registration, use and leaving the platforms). It evaluates data from Edmodo's blogs, privacy policy and terms of service to present unexpected practices that demonstrate the presence of data brokerage as a result of differing visions (commercial vs user) and consent mechanisms. What follows is an introduction to the notion of educational data brokers.

Educational data brokers

There are new kinds of organizations in educational systems (Williamson 2021) that buy and sell teacher and student information, according to the logic of the edtech marketplace (Perrotta, Gulson et al. 2020). Cain (2016) defines data brokers as organizations specialising in collecting, aggregating, and exchanging personal information and de-identified data. Data brokers buy and sell data from private companies and government organizations, and mine publically available information (Crain 2016). These organizations in the context of education align with the term 'meta-edtech' (Williamson 2021) that includes both 'evidence' intermediaries for schools and teachers, as well as market 'intelligence' companies that communicate the value of investing in edtech. The term has not received further definition in contemporary educational research, although has been used to describe organizations and relationships. Williamson (2021) states:

> These evidence and impact groups and organizations act as new kinds of intermediaries in education systems, *brokering* consensus regarding the implementation and use of commercial edtech through the creation and presentation of novel forms of evidence, impact metrics, and product credentialing systems. (emphasis added by author)

And Hakimi, Eynon et al. (2021) state that 'Schools must define their data use philosophy and convey it to stakeholders, including relationships with *data brokers*' (p. 24). The phrase 'data broker' is used here, as it is both an established term in broader contexts and used in educational research.

In this first instance, educational data brokers are described as those who collect information from educational settings to sell to commercial and non-commercial entities for use in for-profit activity, such as marketing and technological development. For example, Williamson (2021) suggests that platforms mediate between educational systems and private sector companies "through the production of 'objective' data about 'what works'" (p. 3) by techniques that shape education and the edtech market towards particular platforms (An & Oliver, 2021). In this respect, platforms build capacity to shape educational realities by promoting potential market trends, challenging to make tangible to teachers and schools. Based on the arguments made by Cain (2016), educational data brokerage highlights firstly that transparency cannot solve privacy issues involved with data brokerage.

Secondly, an imbalance of power exists as consumers cannot control how their data are extracted, aggregated, analyzed and what meaning is made for profit. Hence, brokerage of data is considered necessary in naming these new organizations. To what extent data brokerage is performed by commercial or non-commercial entities remains challenging to assess. Arguably, as Crain (2016) argues, data brokers will not be transparent in their operations without a substantial reorientation of their organization – which at present is legislative. Therefore, I approach this discussion by considering educational data brokers a crucial component of the educational technology marketplace.

Organizations are currently profiting from the commercial data circulating in and around educational systems, modulating educational policy (Sellar and Gulson 2021). The intangibility of their

actions is noteworthy. Building on the argument presented by Perrotta, Gulson et al. (2020), educational data brokers are considered to be leveraging platform logics to suggest objectivity in assessment (Perrotta and Selwyn 2019), present opportunity in personalization (Peters 2009), and highlight value in domain-specific analytics (Dollinger, Liu et al. 2019). Focussing on how these organizations frame educational problems in terms of prediction, cost, and calculability (Gulson and Webb 2017), I suggest introducing the term *educational data broker* will allow more significant debate to occur. Deemed essential, as data brokerage has received healthy consideration in the disciplines of advertising, finance, employment, and health (Crain, 2016), but yet to be given the same scrutiny in educational research. By amassing those that use financial strategies associated with platform capitalism, assetizaiton, servitization, and so on, into the development of what Williamson (2021) calls 'critical meta-edtech' machinery', more profound consideration of their benefits, challenges, and implications can occur.

What follows is the findings of a 'walkthrough' of the commercial edtech platform, Edmodo. The method allows for the synthesis of critical findings and the justification for this new term which can then feed into categorizing organizations in a ''search engine' for critical edtech studies' (Williamson 2021).

The Walkthrough Method: A Platform Analysis of Edmodo

A platform analysis of Edmodo as a typical edtech offering was undertaken using the Walkthrough Method (Light et al., 2018) without *a prior* theoretical notion. The platform analysis was inductive and emergent within the research design (Gillham, 2000). Searching for evidence in this specific context, the platform analysis, through documentation and recording, triangulates 'detached' observations (unexpected practices), evidencing their relationships through artifacts online.

The platform analysis 'walks through' the platform to illustrate how commercial platforms operate. An established method within the communications and media field, the walkthrough method offers an instrument that can be used to explore apps and platforms, irrespective of whether they are educational learning tools or used elsewhere beyond K-12 classrooms. The method analyses (1) The Environment of Expected Use, (2) the Technical Walkthrough, and (3) Unexpected Practices. The Environment of Expected Use identifies ways commercial platforms support or challenge the 'notice and choice' model. The Technical Walkthrough provides a systematic outline of key organizations and has been used to analyze how the platform may modulate the educators' behaviour and conduct. Unexpected Practices relate to any events, practices, or findings that were illuminated due to the walkthrough.

Edmodo

Launched in 2008, Edmodo (www.edmodo.com) was conceived initially as a microblogging tool for teachers and, until recently, often referred to itself the 'Facebook for Education'. Offered originally as a microblogging tool for teachers, Edmodo acquired over 30,000 K-12 Australian teachers in its first three years. Moving forward to 2018, gaming giant NetDragon acquired Edmodo, and in early 2020, offered a new home tutoring service and chatbot called AskMo. Beyond supporting teaching and learning, Edmodo also provides data to marketers and developers in partnership with IBM Watson. Edmodo is justified as a case to consider, due to its deliberate similarities to free social media giant Facebook, that post-acquisition, by gaming giant Netdragon, changed significantly. This suggests a shift away from the profit made possible through Facebook's alignment, a phenomenon not seen with other free edtech platforms. The relevance of the NetDragon acquisition is notable as it marks a shift in Edmodo's model to full-scale data brokering. This paper, in part, explores to what extent this shift was explained and disclosed to educators.

The following explains the methods used to collect and analyze the data used.

What are we walking through? The information used to explore Edmodo

All information in the analysis was sourced from publicly available online sources. Data was sourced from Edmodo's blogs, Privacy Policy, Terms of Service, and Cookies Policy and was time-bound. Data was collected from before and after the NetDragon acquisition in 2018. The Edmodo blog archive (https://medium.com/edmodoblog/archive) was used to retrieve blog posts between January 2018 – July 2018, providing six months of blogs and a total of 36 blog entries. The resulting corpus contained a total of 45,406 words. The time frame includes three months before and after the NetDragon acquisition. The timeframe was chosen to include before, during, and after the acquisition of the Edmodo platform by Netdragon. The Wayback Machine (https://archive.org/web/) was used to locate past websites and privacy policies before the acquisition. The policies included Edmodo Privacy policies, Cookies Policies, Terms of

Service, The Spotlight Terms of Service and the Spotlight User Terms of Service. Data in the form of policy was collected both pre-acquisition (July 2017) and post-acquisition (December 2018) from the websites 'edmodo.com/privacy' (2017) and 'go.edmodo.com/privacy-policy' (2018). Non-scholarly sources, such as LinkedIn (linkedin.com) and Crunchbase (crunchbase.com), were also used to explore Edmodo's communications further.

Data were analyzed through three methods. Firstly, a text-based analysis was completed using the text-analysis software, Voyant. Voyant identifies and compares key term frequencies to create visualizations on returned terminology according to the frequency of use. Supported by the work of Foltz (1996), the analysis focussed on terms associated with the monetization or commercialization of the platform, aiming to compare frequencies of use between each month of blogs over six month period.

Secondly, Edmodo's Policy and Terms of Service were examined guided by Light et al.'s (2018) methodology, in a process similar to comparative policy analysis (Vogel and Henstra 2015). Thirdly, a descriptive analysis was used to understand the various *mediator* characteristics were explored as suggested by the work of (Light et al., 2018). These characteristics aimed to provide insight into how Edmodo may or may not mediate engagement and data collection. Supported by the work of Lankford, Loeb et al. (2002). The researcher used QSR NVivo and Voyant to analyze Edmodo blogs, Privacy and Cookies Policies, and various Terms of Service. As per Light et al.'s (2018) recommendations, non-scholarly sources, such as LinkedIn (linkedin.com) and Crunchbase (crunchbase.com), were used to explore the operating model.

The goal of the text-based analysis was to identify how the platforms communicated with teachers about the monetization of data. The text analysis also analyzed how Edmodo communicated the various partnership schemes (https://partnerships.edmodo.com/app-developers/introduction/) that became apparent on the post-acquisition site. The analysis searched for the proper noun NetDragon, the term data, and the terms commerc*, corpor*, and market*. The grounds for comparison were guided by (Light et al., 2018)'s methodology. The method included looking for length, complexity, and ease of interpretation changes. The Internet Archive's Wayback Machine (https://web.archive.org) was used to illuminate various conceptions of governance and changes over the years, concerning what additions and deletions have occurred within the policies. The frame of reference for the Policy and Terms of Service comparison included Privacy Policies and the general Terms of Service, The Spotlight Terms of Service, and the Spotlight User Terms of Service. The Privacy Policies changed for over two years alongside the acquisition by NetDragon, whereas the Terms of Service did not. The Privacy Policies as of July 2017 (pre) and December 2018 (post) were chosen as they envelop the acquisition date (April 2018). The documents were analyzed line by line using QSR NVivo.

The various *mediator* characteristics suggested by Light et al. (2018) were explored. Mediator characteristics include how the app modulates behaviour through menu placement (Interface Arrangement), enables activity through compulsory fields (Functions and Features), drop-down menus and options (Textual Content and Tone), and the general look and feel (Symbolic Representation). These characteristics were analyzed concerning Registration, Everyday Use, and Exiting the App. What follows are firstly the results of the platform analysis of Edmodo.

Making the actions of educational data brokers tangible

The result report on the findings of the Walkthrough Method according to the following headings: (1) The Environment of Expected Use, (2) the Technical Walkthrough, and (3) Unexpected Practices.

(1) Environment of Expected Use: Operating models and governance structures

The 'environment of expected use' guided the analysis to explore Edmodo's visions, operating models, and governance structures. These results now report on the analysis of two websites and shareholder reports. In 2019, the webpage for teachers was located at https://new.edmodo.com, and the partnerships page was located at https://go.edmodo.com/partners/. Notably, access to the partnerships page from the teacher page was not possible. However, access to the teacher page from the partnerships page is possible.

Visions

In this analysis, three distinct visions for the Edmodo were identified post-acquisition. Edmodo's visions provide insight into its purpose, who they are targeting as users, and various ways in which the platform's data may be used and be valued.

Vision 1 for Educators is directed to teachers, parents, and students. The Educators and Students websites (https://new.edmodo.com) states, "Learn Better Together. Manage your classroom. Engage your students. Safe. Simple. Free" and the webpage states, "Edmodo presents as a safe, engaging means of using social and emotional learning to engage and manage the classroom. It also presents free, with multiple means of engaging online. It presents as having a strong and connected community of teachers, students, and parents of all ethnicity, races, and genders on a global scale."

Vision 2 is directed towards Publishers and Developers. The partnership's website (https://go.edmodo.com/partners/) states, "Partnerships. Education aspires to improve outcomes. Edmodo creates opportunities to invest in yours." The Partnerships website, states "When you develop web and mobile apps for Edmodo, you reach millions of educators and make a direct impact in classrooms around the world" and "Partnering with Edmodo also means you can test your app from the educator and student perspective, and gain insight into how it is being used—feedback that allows you to tailor your app even further and help educators and students make the grade" The vision promotes "53 million members in more than 350,000 schools and over 190 countries worldwide…already in your client portfolio, making adoption easy."

Vision 3 is directed towards Shareholders. Shareholder documentation presents a vision regarding revolutionising education with advanced technologies. The Shareholder report states that they are on a mission to create "the classrooms of the future" (NetDragon, 2018, p. 15) and "The Group is underway to monetize its user base in the online community of Edmodo with a SaaS model as the Group is set to roll out its online tutoring services (AskMo) at the beginning of the upcoming school year in 2019" (NetDragon, 2018, p. 4). The visions were obtained from Edmodo's webpage for 'users' (teachers, parents, and students), Edmodo's webpage for 'developers' (Strategic, Developers, Publishers, Channel, and Brand), and shareholder reports. What follows is an account of Edmodo's operating model.

The Operating Model

To detail Emdodo's operating model concerning educational data brokers, data collected using the Wayback Machine, and various non-scholarly sources, such as LinkedIn (linkedin.com) and Crunchbase (crunchbase.com) was used. In April 2018, Edmodo was acquired by gaming corporation, NetDragon for USD 135 million.

NetDragon has two main businesses, gaming, and education. In 2018, the education business provided a 21.9% year-on-year increase in revenue, representing 50.9% of NetDragon's total revenue (Netdragon 2018, Netdragon 2018). Stating, "The acquisition enables us to offer a complete product portfolio that covers pre-class, in-class and after-class learning environments, anywhere and at any time" (Netdragon 2018, p. 6), NetDragon also states they are ready to "pave the way for us to start content monetization" (Netdragon 2019). Announcing it would "monetize our user base in our online community Edmodo with a SaaS model [via an] online tutoring services (AskMo) at the beginning of the upcoming school year (NetDragon, 2019), Edmodo's 'intangible assets' were valued at close to $18M. NetDragon (2019) states, "We continue to execute our monetization strategy at the home level." In early 2020, Edmodo offered a new home tutoring service and chatbot, called AskMo. AskMo is an algorithmic system designed to help students to learn and draws on the big data collected from multiple teachers interacting online to further develop its capabilities. Edmodo evolved from a microblogging tool with 30,000 teachers to an algorithmically informed, personalization tool with over 80 million users in less than a decade.

Identifying that educational data brokering was present, the investigation then drew on a text-based analysis of Edmodo blog posts, January 2018 – July 2018. The communication surrounding the change in operating model resulting from the acquisition was analyzed. Four blog posts contained the noun 'data', at varying frequencies. Table 1 provides the linguistic data as Key Word in Context (KWIKC) concordance lines. The KWiC lines show the context in which the noun 'data' was used in the corpus. How 'data was used in the corpus does not correlate with the introduction of the Developer and Publisher Programs on the Edmodo platform. Nor does the use of the noun' data' correlate with notions of monetizing data or data commercialisation.

Table 1 KWiC lines to demonstrate the context of the noun 'data' in the corpus Edmodo blogs January 2018 - July 2018

forgets to drain might happen,	data	discrimination is a reality today
the latest forecast from the International	data	Corporation Worldwide Quarterly Augmented and
and the teachers with the	data	and student-insights they need
subject areas on edX are	data	science; computer science and engineering
Wetterhall. Does explore require specific	data	analytics background to understand the

we use the eye gaze	data	, the information is not biased
languages, ages, coordination with other	data	, etc. Imagine having at your
methods, as well as compare	data	and results with other districts
find positive examples of achievement.	data	-driven decision-making promotes a

The frequency of words that may correlate to profiting from data was also analyzed. Verbs such as monetization, commercialization, and selling were examined. 'Sell*' was removed from the analysis, as it was a common statement appearing as a footnote about the blog's authors. Secondly, moneti* provided a null result. The verbs that remained in the analysis (commerc*, corpor*, and market*) of the Edmodo blogs, appeared thirteen times in the corpus. All provided a null result, with the terms unrelated to the context under exploration. The contexts to which the terms occurred included the 'labour market', 'commercially available VR headsets', or discussing marketing as part of informational advertising for an app other than Edmodo. The following section explores Edmodo's governance structures.

Governance Structures

Edmodo's Privacy Policy, Terms of Service, and Cookies policy before and after the NetDragon acquisition were analyzed line by line using NVIVO. Significant changes were not apparent, with the policy over time retaining much of its original content pre and post-acquisition. Minor changes were noticeable, and these changes are what is reported here.

Firstly, the wording was altered from 'including providers of Publisher Software' to 'such as the third parties who publish their content via the Services.' See Diagram 1.

Diagram 1 Comparison of Edmodo Privacy Policy section 'What does this privacy policy cover?' 2017 to 2018

Edmodo Privacy Policy (July 27, 2017) Pre-Acquisition by Netdragon	**Edmodo Privacy Policy (Dec 20, 2018) Post-Acquisition by Netdragon**
This Privacy Policy explains how Edmodo collects and uses information from its Services users, including our treatment of personally identifiable information. This policy does not apply to websites or practices of companies that Edmodo does not own or control, or to individuals that Edmodo does not employ or manage, **including providers of Publisher Software.**	This Privacy Policy explains how Edmodo collects and uses information from its users, including our treatment of personally identifiable information. This policy does not apply to websites or the practices of companies that Edmodo does not own or control, or to individuals that Edmodo does not employ or manage, **such as the third parties who publish their content via the Services.**

Secondly, information related to third party authentication, consent and privacy was expanded. See Diagram 2.

Diagram 2 Comparison of Edmodo Privacy Policy about third party services, referral systems and consent for data access and use from contacts lists, 2017 and 2018

Edmodo Privacy Policy (July 27, 2017) Pre-Acquisition by Netdragon	Edmodo Privacy Policy (Dec 20, 2018) Post-Acquisition by Netdragon
If you are a teacher, and you use our referral service to tell another teacher about our Services, we will ask you for that teacher's name and email address.	You can log in to our site using third-party sign-in services such as Office 365 or Google. These services authenticate your identity and provide you with the option to share certain personal information with us, including your name and email address, to pre-populate our account sign-up form. If you choose to enable a third party to share your third-party account credentials with Edmodo, we may obtain additional information about you via that mechanism.
	If you use our referral service to tell another teacher or a parent about our Services, we may ask you for that person's name, email address, and/or telephone number so that we can send that referral. Conversely, if someone provides us with information about you as part of the referral process, we may obtain that information from that other Edmodo user. Individuals who want Edmodo to delete their information can contact Edmodo at privacy@edmodo.com to request that we remove your information from our database.
	With your permission and consent, Edmodo may access the contact list available on your mobile device or in your email accounts to allow you to connect to your contacts on Edmodo and to invite them to join Edmodo. When you invite others to join Edmodo by using our referral page, we may send text messages or emails on your behalf to that person. Please understand that we do not use your contact list information for any purpose other than to send invitations or messages on your behalf and with your explicit consent.

The policies refer to Services, defined as 'all other websites, products, services and applications made available by Edmodo'. "Services' in the Edmodo policies refer to "not only the edmodo.com website but also all the other websites, products, services and applications made available by Edmodo" (https://go.edmodo.com/terms-of-service/). What follows is consideration of the users' experience. Beginning with how the platform registers users, followed by what happens when Edmodo is being used and when users attempt to leave the platform.

(2) The Technical Walkthrough: Registering for the platform, using it and trying to leave

The technical walkthrough explores data gathering procedures that form part of the registration process, everyday use, and subsequentially when teachers leave or exit the app. Using the Wayback Machine, evidence of a gradual rebranding has been illuminated pre and post-acquisition.

In 2017, Edmodo was described as the 'safest and easiest' way to communicate. Using personalized colour photos of smiling children, Edmodo altered its landing page to cartoon imagery around the time of acquisition, including images similar to Facebook 'likes'. By November of 2018, Edmodo had removed the imagery likened to Facebook, but still maintained references to being widely used on a global scale. In July 2019, any correlation to Facebook and how many people were using the app was not apparent on the landing page. A general neutralization whereby gender, ethnicity, race is obscured in purple, and red cartoon figures occurred. Secondly, correlation to Facebook has also been obscured, and the researcher notes that this occurred alongside unfavourable media relating Facebook to Cambridge Analytica (Plantin & Punathambekar, 2018). The technical walkthrough from this point forward has been performed using the page available as of August 2019 (https://new.edmodo.com). The walkthrough, moving forward, aims to identify whether data brokerage is mediated through the platform's design. They follow reports on the ways Edmodo engages with teachers and students in terms of Registration, Everyday Use, and Exiting the App.

Registration

The analysis begins with the Edmodo Landing page and a focus on registration. The teacher can trial the app on the landing page, but only by signing up for a free online account. There is coloured guidance linking the 'teacher' button to the 'sign in' button. The teacher is thus forced to choose between identifying as a teacher, student, or parent profile. The teacher option requires an email address and password, either a Gmail account or a registered institutional account. Other automated sign-in options through Google and Microsoft Office are also available. No guest option for those wishing to trial the app, without profiling themselves as a teacher, parent, or student is available.

Edmodo's expected use is also communicated according to these segments. The profile choice of 'teacher' highlights that Edmodo is both convenient and time-saving, and the student vision communicates raising confidence and empowering learning. Once selecting a 'teacher' profile, returning to the landing page automates your preferences. If signing in as a parent, the site refers to staying in sync with teachers and monitoring student progress. Signing out and logging in as a parent rather than a teacher is difficult to enact as parents are invited via a code after logging into the student version of the app. Focussing on Teachers and moving beyond the landing page onto the 'teachers' welcome page (go.edmodo.com/teachers), emotive language is apparent. For example, the site states, "Everyone remembers the teacher who made a difference in their life. With communication tools like Posts and Messages, Edmodo helps you be that teacher for your students." The teacher then registers with Edmodo and can opt into various categories.

Everyday Use

Everyday use refers to various activities to which the teacher regularly engages with the app or platform, such as the functionality, what options are provided, and the affordances Edmodo provides to the teachers. The app's menu has been used to trace mediators.

The menu system on Edmodo is segmented in a structured fashion. The Teachers' dashboard includes various categories such as Classes, Library and Messages, and another link to the Edmodo store, Spotlight. Considering the interface's arrangement, it is apparent that Edmodo's structuring is quite organized towards 'Educational Practice' according to user design principles (Shneiderman and Plaisant 2010), as it is on the top and left-hand side. In contrast, Publishers and Developers (including the calendar) are grouped on the right-hand side. Therefore, the app has placed the Edmodo shop, Microsoft Apps (including Onenote / Immersive Reader), and the calendar (real-time information about users) in a prime position within the app's interface. This positioning arguably highlights that priority has been given to monetising data over educational practice (left-hand side of the interface).

The navigation text and imagery remain the same at various app levels, with the menu icons symbolizing different cultural representations, races, and ethnicities. For example, 'Home' is a globe, 'Progress' is a heartbeat, and Spotlight is a boutique shopfront. The icons and the general aesthetic of the Edmodo app circulate various shades of blue. Blue is often considered a safe colour, builds trust, and relax users (Shneiderman and Plaisant 2010). Red, however, is considered to be a colour of excitement. Red contrasts starkly on the interface, with only the location beacon and Microsoft icon red. The blue emphasizes Edmodo's smooth and safe functionality, which Light et al. (2018) suggest digitally mediates behaviour.

Leaving the App.

Edmodo provides an opportunity for the teacher to 'Log Out'. However, this does not remove their relationship with the app. That is, it doesn't constitute leaving the app. The teacher can readily deactivate their account in the settings, and Edmodo provides precise details concerning what will happen. The platform communicates that it will remove all content, posts, and student work. The Deactivate Your Account information does not clarify whether de-identified data such as this will also be removed from databases.

First, Edmodo's Privacy Policy explains Cookies and various other tracking devices to teachers, such as single-pixel gifs that may remain when an account is deactivated (ACCC 2019). Whether Edmodo and its partners use session-based or persistent cookies is not clear. Cookies are text files that store information about the user for use on subsequent visits and are unique to the individual's account or browser. Persistent cookies require the individual to delete them or wait until they expire, whereas session-based cookies get deleted when the browser closes (ACCC 2019). Edmodo acknowledges that third-party cookies are not covered by their policies. Therefore when the teacher deactivates their Edmodo account, they may not be deactivating the cookies from either Edmodo or their partners.

Secondly, Edmodo states that they may use 'single-pixel gifs', which, when used alongside cookies, are used to "compile aggregated statistics to analyze (s) how the Services are used" (McCluskey 2014), 138). Single-pixel gifs can also be referred to as a 'web beacon' and are usually coloured to align with a background of a page or email. They enable the tracking of the teachers' behaviour, including "typed entries and mouse movements, clickstream data, information from previously set cookies, and even recording conversations through a computer's microphone or images from the computer's camera" (West, Heath et al. 2016). Edmodo confirms that it also uses web beacons within its policy. Edmodo's website includes Cambridge University Press, Microsoft, and various developers, publishers, and channel partners. As such, multiple partners, discussed here as brokers, are encouraged to leverage Edmodo's membership base within schools worldwide to grow their business and bottom line (https://go.edmodo.com/partners/). Therefore, when teachers' trial Edmodo but do not necessarily use it, vast numbers of cookies and single pixel-gifs begin collecting data for these multiple partners.

The following section considers the information from the walkthrough and sheds light on unexpected practices.

(3) Unexpected Practices: What have we found due to the walkthrough?

The final component of the Walkthrough method aims to triangulate unexpected practices by evidencing their relationships through the artifacts discussed above. Unexpected Practices relate to any events, procedures, or findings illuminated due to the walkthrough discussed concerning current literature.

Edmodo's three visions were decisively different. Their aims, strategies, and actual impact on teachers and schools were demonstrative of obfuscated data brokerage. These artefacts support an argument that educational data brokers operate in the Australian classroom but remain relatively obscure and potentially obfuscated. The literature to support or challenge this argument was limited. Perrotta, Gulson et al. (2020) discuss how Google acts as (what is described here) an educational data broker through cross-platform interoperability via application programming interfaces (APIs) through examination of technical documentation of the Google Classroom API. Their research reveals various third-party applications integrated into Google Classroom and presents relatively novel research in this space. Secondly, the Australian Competition and Consumer Commission (ACCC 2019) explains how data collection and use relate to consent and privacy. For example, the flag that information asymmetries challenge making informed consent about data collection and usage. Kemp (2019) further supports this, who details the notion of concealed data practices that effectively obscure data brokerage through policy interpretability.

Normalised and common, the arguable obfuscation of data collection, sale and use in other contexts beyond educational systems, is now actively being challenged. Current literature aligned with the findings would suggest that these visions are deliberately obfuscated to maximize the profitability of the data. Thus an obfuscation of information from educational settings is being sold to commercial and non-commercial entities for use in for-profit activity, such as marketing and technological development. The claim of obfuscation is arguably evidenced by the ease with which developers could access the Educators site, but access to the developer's site was 'hidden'. Aligning to Facebook's decrease in educational data brokerage as a result of Cambridge Analytica (ACCC 2019), this obscuring of data collection and use is seen to be an essential feature of how educational data brokers operate. It is noteworthy that it is a well-established practice and Ideland (2021) argues demonstrates "a commercialized, neoliberal rationale made possible in schools" (p. 33).

The ACCC (2019) discusses Facebook's partnerships with data brokers, which terminated in March 2018 after Cambridge Analytica privacy issues (Cadwalladr and Graham-Harrison 2018). The ACCC (2019) highlights that users can still be targeted by Facebook with advertising, according to their 'purchasing and other off-platform behavior… [such as]… data they have collected first hand from the user (for example, via a customer membership list), or have bought from a third party' (p. 87). For instance, as gender is a feature when signing up to Facebook, the social media platform has very accurate user data. Students and teachers 'self-classify' when signing up to Edmodo, as seen in the technical walkthrough. The data are used to create, curate, and manipulate datasets for profit. These datasets enhance the commercial offering, sold to other companies, or sold as part of company acquisitions – as evidenced by the Edmodo acquisition by Netdragon in this paper. In this case, we saw that students and teachers effectively lost contact with the intangible data flows coming and going from their use of Edmodo in and out of the classroom. This is further entrenched when considering that edtech profits from "an entanglement of human and software labour" (Fyfield, Henderson & Phillips, 2021, p. 47). The means and ways that educational

data brokers are seen to be an 'old' process, but a 'new' kind of organization that benefits from remaining intangible in educational settings. Acknowledging that the evolution of data brokers in education remains under-discussed in educational research, the findings that teachers and students' negotiation of commercial policy and informed consent present as a tension demanding attention.

Informed consent is seen to require the teacher and student to consent for their data to be collected by a commercial platform. To do so, the student and teacher must have reasonably explained what data are collected, what it is being used for, how it will be stored, who has access to it, and when it will be deleted (Royakkers, Timmer et al. 2018). Often provided as a 'tick box' opt-in, the ACCC (2019) argues that meaningful consent is not being obtained through this process. This argument is supported by Obar and Oeldorf-Hirsch (2016), who suggests that there are deep flaws in assuming people can interpret legal policy associated with 'opting in' via a tick box. As seen in the findings, 'signing up' was relatively easy – however, 'leaving the app' was increasingly difficult. Pragmatically, this has also been demonstrated across multiple platforms. Rennie, Schmieder et al. (2019), in an exploration of privacy and app use in Australian primary schools, found that 60% of teachers did not explicitly consider privacy. Stating, "The apps that we found schools to be using do not necessarily reference Australian law in their privacy statements, instead referring to the laws and frameworks of the countries where they were created (if at all)" (p. 8). As such, Rennie et al. (2019) argue that there is a failure of consent occurring within schools, as apps used by teachers in the public system need to comply with their associated state or territory privacy laws.

In contrast, those in the independent system need to abide by the Privacy Act and the Australian Privacy Principles. This notion is further supported by Kemp (2019) and the ACCC (2019). However, Kemp (2019) expands on this requirement to explain how concealed data practices are further complicating people's understanding of how their data are collected and used.

The ability to make informed consent is considered to be challenged by information asymmetries (ACCC, 2019) and concealed data practices (Kemp, 2019). An information asymmetry is a deficiency of cognitive information related to the algorithmic identity. According to the ACCC (2019), information asymmetries are evident when individuals cannot access the information they need to make informed choices about their privacy when negotiating digital platforms. Information asymmetries may be present because either information is not available, or they are not aware or are unable to understand it. A concealed data practice "occurs when suppliers' terms provide weak privacy protections for consumers while the extent of those terms, the resultant data practices and the consequences of these data practices, are concealed from consumers" (Kemp 2019, p. 11).

This paper has demonstrated that organizations, referred to as educational data brokers, collect information from educational settings to sell to commercial and non-commercial entities for use in for-profit activity, such as marketing and technological development. The ACCC argues such practices are familiar with commercial apps and platforms, stating that the average length of policies for digital platforms contains between 2,500 and 4,500 words and takes between 10 and 20 minutes to read (ACCC, 2019). Unreasonable expectations to read and interpret commercial policy are further supported by McDonald and Cranor (2008). They argue that consumers are presented with 1,462 privacy policies per annum on average, meaning that it would take 76 eight-hour days to read them. Therefore, with data collection concealed, information asymmetries normalized and edtech increasing entangling human and software labour (Fyfield, Henderson & Phillips, 2021), the findings present evidence of both information asymmetries and concealed data practices within and through the use of Edmodo.

Conclusion: Challenging educational data brokers

A new kind of organization has appeared in the education technology landscape. Education technology brokerage is flourishing with the increasing data being produced, collected, and disseminated in and around educational settings. Connecting organizations with various drivers influences schools' educational technology purchasing through marketing and communications (ACCC 2016), as well as what is on offer through the development of new technologies (Perrotta and Selwyn 2019, Perrotta, Gulson et al. 2020).

The evidence of educational data brokerage has been demonstrated by analysing only one platform found within educational settings across Australia. With thousands of educational apps and platforms being used and trialled by teachers (Rennie, Schmieder et al. 2019), the size and scope of educational data brokerage as an organization, is hard to imagine. Thus raising the question of what can we do? As indicated here, the first step is to acknowledge that this data organisation for profit has implications for teachers and schools. Secondly, we need to be critical about edtech and question the extent to which edtech supports education, compared to the extent educational data supports edtech profits. The walkthrough method

provides a systematic and straightforward means to synthesize such critical findings. The benefits would be encouraging and activating active dissonance towards advertising without peer-reviewed research. But more so, to orient policymakers, researchers and educators, students and users more broadly towards the development counter-arguments concerning the *need* for commercial collection and use of data from within and around educational systems.

In sum, this paper has examined a concrete example of educational technology brokering by 'walking through' educational technology platform Edmodo. The findings demonstrate brokerage is present and thriving, highlighting that further investigations about educational data brokers must be examined more widely. Without doing so, educational data brokers will arguably circumnavigate legislation in educational settings to assemble expertise and continue to profit from education without constraint. We must acknowledge that brokerage is being challenged in multiple other contexts for reasons associated with privacy and consent and act in similar ways within global educational settings. There is a growing need for evidence data brokering in educational systems. This paper recommends research into how data brokerage may impact educational leadership, teachers and procurement. For example, suppose educational data is influential in financing capital needed to develop emergent technologies and shaping edtech development in the coming years. In that case, we need research to demonstrate that historical biases are not shaping funding systems. This paper thus calls for more research into how edtech uses educational data to predict what is needed for educational systems to 'work' and the social, political and economic impacts of commercial predictions.

Limitations, Credibility, and Trustworthiness

Being a largely empirical article, the credibility of these claims is essential to consider. Limitations in terms of data that was accessible and the time-sensitive nature of rapidly changing marketing and communications are acknowledged. As such, the findings are not generalizable, instead provide a snapshot of evidence that could be used to explore educational data brokers in other contexts. Guba (1981) proposes that where objectivity is not the leading force in the inquiry, credibility and trustworthiness replace reliability and validity. Credibility relates to reaching a very similar conclusion by approaching a question from different angles and providing a relatively small number of carefully chosen, credible cases (Morgan, Ross et al. 2018) such as Edmodo. In this analysis, credibility has been operationalized by referring directly to the data and evidencing a broadly repeatable method, thus also making the findings trustworthy. Guided by Lincoln and Guba (1985), the analysis provides detailed descriptions that allow those who wish to transfer the findings to a different context to make their judgment on its transferability.

References

An, Tao, and Martin Oliver. "What in the World is Educational Technology? Rethinking the Field from the Perspective of the Philosophy of Technology*." Learning, Media and Technology* 46, 1 (2021). https://doi:10.1080/17439884.2020.1810066.

ACCC. "The Australian Competition and Consumer Commission." 2016.

———. "Digital Platforms Final Report." edited by accc.gov.au. https://www.accc.gov.au/system/files/Digital%20platforms%20inquiry%20-%20final%20report.pdf, 2019.

Arantes, Janine A. "The Servitization of Australian K-12 Educational Settings." *Postdigital Science and Education* (2020): 1-29. https://doi.org/10.1007/s42438-019-00097-0.

Birch, Kean, Margaret Chiappetta, and Anna Artyushina. "The Problem of Innovation in Technoscientific Capitalism: Data Rentiership and the Policy Implications of Turning Personal Digital Data into a Private Asset." *Journal of Policy Studies* 41, no. 5 (2020): 468-87. https://doi.org/10.1080/01442872.2020.1748264.

Cadwalladr, Carole, and Emma Graham-Harrison. "Revealed: 50 Million Facebook Profiles Harvested for Cambridge Analytica in Major Data Breach." *The Guardian* 17 (2018): 22.

Dollinger, Mollie, Danny Liu, Natasha Arthars, and Jason Lodge. "Working Together in Learning Analytics Towards the Co-Creation of Value." *Journal of Learning Analytics* 6, no. 2 (2019): 10–26-https://doi.org/10.18608/jla.2019.62.2.

Foltz, Peter W "Latent Semantic Analysis for Text-Based Research." *Behavior Research Methods, Instruments, Computers & Education* 28, no. 2 (1996): 197-202. https://doi.org/10.3758/BF03204765.

Fyfield, Matt., Michael Henderson, and Michael Phillips. "Navigating Four Billion Videos: Teacher Search Strategies and the YouTube Algorithm." *Learning, Media and Technology* 46, 1 (2021), https://doi:10.1080/17439884.2020.1781890.

Guba, E. "Criteria for Assessing the Trustworthiness of Naturalistic Inquiries." *ECTJ* 29, no. 2 (1981): 75. https://doi.org/10.1007/BF02766777

Gulson, Kalervo N., and P. Taylor Webb. "Mapping an Emergent Field of 'Computational Education Policy': Policy Rationalities, Prediction and Data in the Age of Artificial Intelligence." *Research in Education* 98, no. 1 (2017/08/01 2017): 14-26. https://doi.org/10.1177/0034523717723385.

Hakimi, Laura, Rebecca Eynon, and Victoria A Murphy. "The Ethics of Using Digital Trace Data in Education: A Thematic Review of the Research Landscape." Review of *Educational Research* (2021). https://doi.org/10.3102/00346543211020116.

Ideland, M. 2021. "Google and the End of the Teacher? How a Figuration of the Teacher is Produced through an Edtech Discourse." *Learning, Media and Technology* 46 (1). doi:10.1080/17439884.2020.1809452.

Kemp, Katharine. "Concealed Data Practices and Competition Law: Why Privacy Matters." *UNSW Law Research Paper*, no. 19-53 (2019). https://doi.org/10.2139/ssrn.3432769.

Komljenovic, Janja. "The Rise of Education Rentiers: Digital Platforms, Digital Data and Rents." *Learning, Media and Technology* (2021): 1-13. https://doi.org/10.1080/17439884.2021.1891422.

Lankford, Hamilton, Susanna Loeb, and James Wyckoff. "Teacher Sorting and the Plight of Urban Schools: A Descriptive Analysis." *Educational Evaluation Policy Analysis* 24, no. 1 (2002): 37-62. https://doi.org/10.3102/01623737024001037.

Light, Ben, Jean Burgess, and Stefanie Duguay. "The Walkthrough Method: An Approach to the Study of Apps." *New Media & Society* 20, no. 3 (2018): 881-900. https://doi.org/10.1177/1461444816675438.

Lincoln, YS, and EG Guba. "Naturalistic Observation." Thousand Oaks, California (1985).

Lupton, Deborah. 2021. "'Honestly no, I've never looked at it': teachers' understandings and practices related to students' personal data in digitised health and physical education." *Learning, Media and Technology* 46 (3):281-293. https://10.1080/17439884.2021.1896541.

McCluskey, Fiona. and Matthew Winter. Academic freedom in the digital age. *On the Horizon*, 22(2), 136-146. (2014). https://doi.org/10.1108/OTH-09-2013-0033.

McDonald, Aleecia M, and Lorrie Faith Cranor. "The Cost of Reading Privacy Policies." *ISJLP* 4 (2008): 543.

Moore, Shannon Dawn Maree, Bruno De Oliveira Jayme, and Joanna Black. "Disaster Capitalism, Rampant Edtech Opportunism, and the Advancement of Online Learning in the Era of Covid19." *Critical Education* 12, no. 2 (2021).

Morgan, Amy J, Anna Ross, and Nicola J Reavley. "Systematic Review and Meta-Analysis of Mental Health First Aid Training: Effects on Knowledge, Stigma, and Helping Behaviour." *PloS one* 13, no. 5 (2018): e0197102. https://doi.org/10.1371/journal.pone.0197102.

Netdragon. "2018 Annual Report." edited by Netdragon Websoft Holdings Ltd. http://file.download.99.com/down/ir_e_20190430.pdf, 2018.

———. "Disclosable Transaction in Relation to the Merger of Merger Sub with and into Edmodo." http://file.download.99.com/down/ir_e_20180408.pdf: Netdragon Websoft Holdings Limited, 2018.

———. "Interim Report." Stock Code 777 (2019).

Obar, J., and A. Oeldorf-Hirsch. "The Biggest Lie on the Internet: Ignoring the Privacy Policies and Terms of Service Policies of Social Networking Services." In TPRC 44: The 44th *Research Conference on Communication, Information and Internet Policy 2016*, 1-33, 2016. https://doi.org/10.2139/ssrn.2757465.

Perrotta, Carlo, Kalervo N Gulson, Ben Williamson, and Kevin Witzenberger. "Automation, APIs and the Distributed Labour of Platform Pedagogies in Google Classroom." *Journal of Critical Studies in Education* (2020): 1-17. https://doi.org/10.31219/osf.io/724sc.

Perrotta, Carlo, and Neil Selwyn. "Deep Learning Goes to School: Toward a Relational Understanding of AI in Education." *Learning, Media and Technology* (2019): 1-19. https://doi.org/10.31235/osf.io/48t7e.

Peters, Michael A "Personalization, Personalized Learning and the Reform of Social Policy: The Prospect of Molecular Governance in the Digitized Society." *Policy Futures in Education 7*, no. 6 (2009): 615-27. https://doi.org/10.2304/pfie.2009.7.6.615.

Rennie, Ellie, Kathrin Schmieder, Julian Thomas, Sarah K. Howard, Jun Ma, and Jack Yang. "Privacy and App Use in Australian Primary Schools: Insights into School-Based Internet Governance." *Media International Australia* (2019) https://doi.org/10.1177/1329878X19828368.

Royakkers, Lambèr, Jelte Timmer, Linda Kool, and Rinie van Est. "Societal and Ethical Issues of Digitization." *Ethics and Information Technology* (March 16 2018). https://doi.org/10.1007/s10676-018-9452-x.

Russell, N Cameron, Joel R Reidenberg, Elizabeth Martin, and Thomas B Norton. "Transparency and the Marketplace for Student Data." *Virginia Journal of Law and Technology* 22 (2018): 107. https://doi.org/10.2139/ssrn.3191436

Sadowski, Jathan. "When Data Is Capital: Datafication, Accumulation, and Extraction." Big *Data & Society* 6, no. 1 (2019): 2053951718820549. https://doi.org/10.1177/2053951718820549.

Sellar, Sam, and Kalervo N. Gulson. "Becoming Information Centric: The Emergence of New Cognitive Infrastructures in Education Policy." *Journal of Education Policy* 36, no. 3 (2021/05/04 2021): 309-26. https://doi.org/10.1080/02680939.2019.1678766.

Selwyn, Neil. "The Human Labour of School Data: Exploring the Production of Digital Data in Schools." *Oxford Review of Education* (2020): 1-16. https://doi.org/10.1080/03054985.2020.1835628.

Shneiderman, Ben, and Catherine Plaisant. *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Pearson Education India, 2010.

Srnicek, Nick. *Platform Capitalism*. John Wiley & Sons, 2017.

Swant, Marty. (2022) Europe's New Ruling On Data Consent Pop-Ups Challenges Privacy Policies For Publishers And Advertisers, *Forbes*. Feb 2, 2022. Retrieved from https://www.forbes.com/sites/martyswant/2022/02/02/europes-new-ruling-on-data-consent-pop-ups-challenges-privacy-policies-for-publishers-and-advertisers/?sh=283e1b1827e6

Vogel, Brennan, and Daniel Henstra. "Studying Local Climate Adaptation: A Heuristic Research Framework for Comparative Policy Analysis." *Journal of Global Environmental Change* 31 (2015): 110-20. https://doi.org/10.1016/j.gloenvcha.2015.01.001.

West, Deborah, David Heath, and Henk Huijser. "Let's Talk Learning Analytics: A Framework for Implementation in Relation to Student Retention." *Online Learning* 20, no. 2 (2016): 150-70. https://doi.org/10.1145/2460296.2460299.

Williamson, Ben. "Meta-Edtech." *Learning, Media and Technology* 46, no. 1 (2021): 1-5. https://doi.org/10.1080/17439884.2021.1876089.

Williamson, Ben, and Anna Hogan. "Commercialisation and Privatisation in/of Education in the Context of Covid-19." *Journal of Education International Research* (2020).