

Learner Experiences in an Activity-Based Online Course From a TPACK Perspective

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Abstract

In this study, we applied the TPACK framework to design and develop an online course on 'Digital Storytelling in Education' using the activity-based learning approach. The course was designed with different learning activities developed around the TPACK knowledge domains, to develop the techno-pedagogical skills of educators. It was offered over 4 consecutive academic years (2020-2023) with a cumulative total of 164 learners. In this study, the aim is to examine and understand learners' experiences in terms of their perceptions, reflections, and challenges in the "Digital Storytelling in Education" module. Data related to the learners' experiences were collected from their reflective portfolio which is a feedback activity assigned to them. Learners were encouraged to work out this activity in a personal journal online. From the feedback activity, important information such as learners' opinions about the effectiveness of the course, their expectations, and perceptions were collected. The data was used to study the learners' perceptions of their learning experiences and skills acquired in terms of their TPACK competencies. From the feedback gathered, learners in general appreciated the level and types of tutor support throughout the course, especially when they had to manipulate new software and develop new digital competencies through semi-structured learning activities. The classification of the learner feedback from the records shows that most of the learners reported gains in technological knowledge followed by content knowledge and then pedagogical (content) knowledge.

Keywords: Digital Storytelling, TPACK, Activity-Based Learning, Teacher Education

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Introduction

The integration of technology in education has become increasingly important in the digital age with its potential to enhance teaching and learning experiences (Kozlova & Pikhart, 2021; Özdemir, 2017). Digital learning, e-Learning, online learning, blended learning, and remote learning are all terms that are often used interchangeably to describe courses which has an online or blended mode of instruction, which can be delivered either in synchronous or asynchronous ways (Kumar Basak, Wotto & Belanger, 2018). Such courses have gained in popularity given their ability to offer flexibility, accessibility, and interactive learning opportunities to geographically dispersed learners. Digital learning has the potential to support educators in improving their pedagogical methods and can also benefit students in their learning journey, providing a platform for effective communication (Dagada & Chigona, 2013). However, for meaningful learning experiences to occur, it is important to dedicate careful attention to the design and development of online courses. There are factors such as learning design principles, technological tools, and content knowledge that need to be considered to promote active learning through student engagement and interaction as well as to support the different needs of the learners (Gameil & Al-Abdullatif, 2023; Lieser, Taf & Murphy-Hagan, 2018). The Technological Pedagogical Content Knowledge (TPACK) framework provides a comprehensive approach to designing and developing technology-enhanced learning experiences (Mishra & Koehler, 2006).

In this study, we applied the TPACK framework to design and develop an online course on ‘Digital Storytelling in Education’ using the activity-based learning approach. Given the importance to prepare educators to develop their digital competencies to integrate ICTs in their teaching, the course ‘Digital Storytelling in Education’ was implemented within the B. Ed. Primary Programme. The course aimed to contribute to the development of the so-called 21st-century skills expected from educators in a technology-enabled learning context. The focus is on the development of diverse skill sets such as digital literacies, language learning, visual conceptualization, and global literacy (Robin, 2016).

The course was designed with different learning activities developed around the TPACK knowledge domains, to develop the techno-pedagogical skills of educators. It was offered over 4 consecutive academic years (2020-2023) with a cumulative total of 164 learners. In this study, the aim is to examine and understand learners’ experiences in terms of their perceptions, reflections, and challenges in the “Digital Storytelling in Education” module, which was developed using the TPACK framework. This study adopts a design-based research approach and is mainly qualitative. It explores learner experiences through feedback to gain insights into the effectiveness of the online course design.

Literature Review

The TPACK framework is being widely used by researchers and educators, given the global accelerated development and adoption of digital technologies (Bingimlas, 2018). The core learning design principle behind TPACK is the balance between the integration of technology with pedagogical and content knowledge (Koehler, Mishra & Cain, 2013; Koehler & Mishra, 2005). Consequently, as the TPACK framework acknowledges the importance of education technology integration for effective teaching and learning, it is also important to understand the three core components it encompasses and their various facets of knowledge (Su, 2023; Mishra, 2019). These components are:

- Technological Knowledge (TK): Refers to the teacher's knowledge about different technologies and digital tools and the ability to use them effectively to enhance students' learning experiences.
- Pedagogical Knowledge (PK): Describes the teacher's knowledge about the methods and practices of teaching. It also includes an understanding of instructional strategies, processes, and techniques for effective teaching and learning experiences.
- Content Knowledge (CK): Refers to the teacher's knowledge of the subject matter to be taught, including an understanding of the concepts, theories, and principles.

These three components interplay and interact with each other to form the TPACK framework that establishes a basis for teaching using educational technology. They are fundamental components for teachers, to effectively integrate technology in their teaching practices within a balanced understanding of technology, pedagogy, and content for enhanced teaching and learning experiences. The TPACK framework also forms two additional intersections namely the Technological Content Knowledge (TCK) and the Technological Pedagogical Knowledge (TPK). TCK is basically knowledge of how to apply technology to a specific content area to improve student experiences and learning outcomes in that specific content area. According to Mishra and Koehler (2006), teachers need to know “not just the subject matter they teach, but also the manner in which the subject matter can be changed by the application of technology”. On the other hand, TPK refers to the “knowledge of the existence, components, and capabilities of various technologies as they are used in teaching and learning settings, and conversely, knowing how teaching might change as the result of using technologies” (Mishra & Koehler, 2006).

The effectiveness of the TPACK framework is established through its coherent inter-relationship with the domains of content, pedagogy, and technology-related knowledge and results from its integration in technology-enabled educational contexts (Angeli, Valanides & Christodoulou, 2016). There are also several studies that highlighted how TPACK has been successfully implemented in teaching (Rienties et al. 2013; Lee & Kim, 2014; Wang, Gu & Liu, 2020; Lachner et al. 2021). Su (2023) argued that teachers should employ the TPACK framework in their practices. She explained that TPACK is an inclusive framework that allows teachers to use it as an effective tool to integrate technology into teaching and equip students with the necessary digital literacy skills. The application of TPACK was also found to be helpful and effective, promoting positive outcomes in language learning courses and platforms (Tseng et al. 2020).

The effectiveness of TPACK in teacher education has also been a subject of interest by educational researchers. Ortega-Sánchez and Gómez-Trigueros (2020) used the TPACK framework to design a teacher training course in Geography and History. Their study reports that the approach was generally effective in developing the techno-pedagogical skills of the trainee teachers in addition to their core content knowledge in the subject area. Hofer and Grandgenett (2012) sought to study the development of technological pedagogical content knowledge (TPACK) of trainee teachers over an 11-month period for an MA in Education course. Their study revealed significant development of the participants' technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK), but only limited growth in technological content knowledge (TCK). As part of their research findings on TPACK knowledge of pre-service educators, Santos and Castro (2021) reported that TPACK applications were primarily influenced by TPK and TCK with TPK exerting a higher influence on the applications of TPACK by pre-service teachers. In other words, their confidence level in terms of knowledge and appreciation of how technology can improve their

outcomes, will more likely result in their adoption of TPACK. However, applying TPACK in teacher training may not necessarily result in better technological knowledge depending on the subject's nature and the learning design approaches used by course designers. This is evident in the research of Valtonen et al. (2019) where they observed a gain mainly in PCK for the pre-service teachers in a biology course using the TPACK framework. They argue that to support the development of pre-service teachers' more balanced TPACK, it is important to make the role of technology a more explicit target for learning within the context of biology and inquiry learning.

One of the approaches to address this issue is through technology-enabled activity-based learning designs. Santally and Senteni (2004) defined the occurrence of authentic learning in online modules as a three-phased process consisting of knowledge acquisition, knowledge application, and knowledge construction through reflective practices. Cooper (1998) examined active learning vs. passive lecture-based instruction in chemistry courses. The results showed improvements in student grades, completion rates, attitudes towards chemistry, and conceptual mastery. Santally (2013) further outlined a set of good practices for the application of activity-based learning designs in teacher education to address the new set of competencies needed from educators in the 21st century. Schneider (2003) postulated that activity-based learning allowed the creation of learning environments that provide a “clear focus” (learning activity support, management, and scenario orchestration) but also necessary “fuzzy edges” (community support). Ozgur (2021) applied the concept of activity-based learning to improve the TPACK competencies for 16 in-service teachers. Findings obtained in the study revealed that teachers' scores on the TPACK-deep scale increased significantly compared to the pre-study.

An Overview of the “Digital Storytelling in Education” Course

The ‘Digital Storytelling in Education’ course is generally offered as an elective option in the B. Ed. Primary Programme at the Mauritius Institute of Education. The course was offered online, and it was assessed fully by coursework. The course was structured into five main themes that were covered over one semester of 15 weeks. Basically, the duration of each theme was determined based on the depth of the topic and the anticipated level of effort that learners needed to dedicate to learning, collaborating, and practicing. For each theme, there was an overview and the learning objectives that were provided, to give learners a comprehensive understanding of the topic that would be covered, including the learning outcomes they will achieve at the end. Each theme has a learning resources section, which contains all the pedagogical resources relevant to that specific theme. The resources were in the form of online presentations, weblinks, pdf documents, and even educational videos. Each theme has also a learning activity section, which consisted of coursework to be completed for that specific theme. Finally, each theme has also a support forum section, where learners seeking clarifications can post their queries, pertaining to that specific theme. The coursework given across all the themes are different learning activities, in the form of participation in discussion forums, reflection exercises, creation of storyboard and digital story, and journal activity. For one semester, the learners studied digital storytelling as an innovative tool in the classroom and developing digital stories. The course was hosted on Moodle and the schema below gives an indication of how the course was structured on the e-Learning platform:

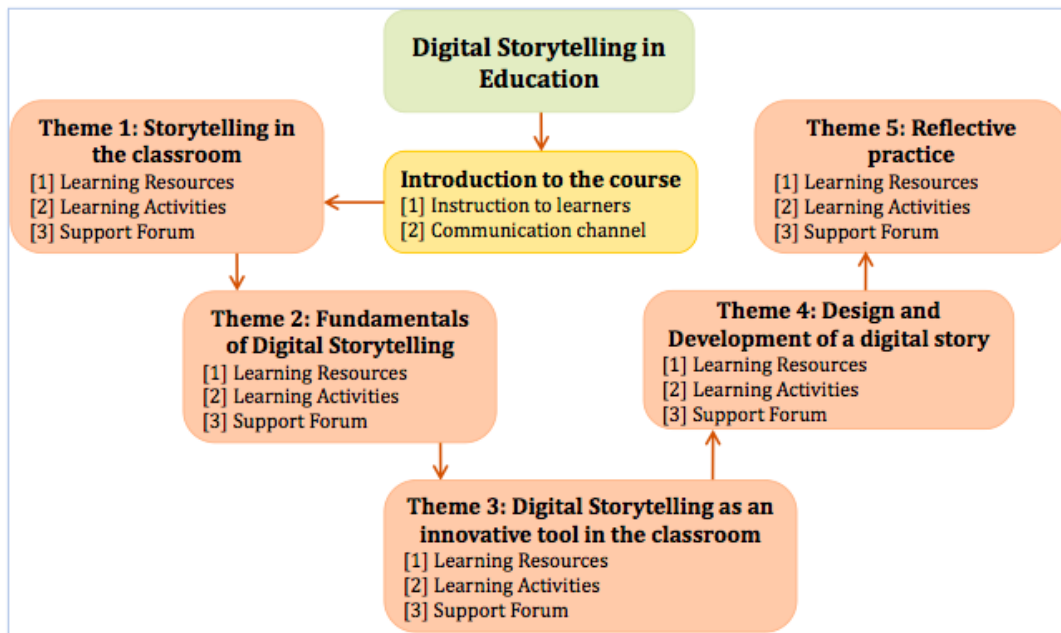


Figure 1: The course structure on the Moodle platform, using an activity-based approach.

Research Context

Research Design

The main purpose of this study is to explore the learner experiences in an activity-based online course on “Digital Storytelling in Education” which was developed using the TPACK framework. The research seeks to capture their learning experiences in terms of their perceptions, reflections, and challenges encountered during their learning journey. This study adopts an exploratory design-based research approach. It explores learner experiences from a descriptive approach through feedback to gain insights into the effectiveness of the online course design. The main research question for this study is related to the learners’ perceptions of their overall learning journey in the online course “Digital Storytelling in Education” from the TPACK perspective.

Participants

The participants for this study are learners enrolled in the B.Ed. Primary Programme at the Mauritius Institute of Education and who chose the ‘Digital Storytelling in Education’ course as their preferred elective. The profile of learners for this study are primary school educators, who seek to extend their knowledge and skills in the teaching and learning of specific domains. They aspire to pursue their expertise in specialized areas of interest. A total number of 164 learners participated in the course which was offered from 2020-2023.

Data Collection

Data related to the learners’ experiences were collected from their reflective portfolio which is a feedback activity assigned to them. Learners were encouraged to work out this activity in a personal journal online. From the feedback activity, important information such as learners’ opinions about the effectiveness of the course, their expectations, and perceptions were collected. The data was used to study the learners’ perceptions of their learning experiences and skills acquired in terms of their TPACK competencies.

Data Analysis

Each feedback from the theme 5 activity was assessed to look for elements related to each of the categories of the TPACK framework. The number of occurrences of each category was noted. This process was carried out using expert evaluation by the course developers. Learner perceptions and general experience with the course were also analyzed mainly using a descriptive approach from the perspectives of (i) tutor support, (ii) workload, (iii) feel-good factor, and (iv) overall achievement. We could process only 137 out of the 164 student feedback statements based on their relevance to the TPACK skills development.

Ethical Considerations

As part of the learning activity, the learners were also informed beforehand that their feedback will be shared solely with their lecturer and treated in confidentiality. In this paper, we have ensured the anonymity and confidentiality of the data, before the data analysis process.

TPACK Framework Integration in Course Design

As the course was designed using the TPACK framework within an activity-based learning approach, we integrated the TPACK components (technological knowledge, pedagogical knowledge, and content knowledge) into the learning resources, activities, and assessments. Basically, there are three approaches – one can focus initially on the content or technological knowledge to start with, or with the pedagogical knowledge depending on the preference of the learning designer, or the learning outcomes. In our case – we focused on content and pedagogical content knowledge first as storytelling is a learning design method. This was the main approach in theme 1. Below is a brief description of how each theme was structured:

Table 1: Description of course themes and learning activities.

Theme	Description	TPACK Components
# 1: Storytelling in Education	The learning resources provided in this theme, give learners an understanding of how storytelling can be applied in different educational contexts, including the classroom. The theme also focused on developing learners' pedagogical knowledge to understand the effectiveness of storytelling as a teaching method. The learning activity in this theme is based on a presentation that learners are required to prepare, based on a story they want to introduce in the classroom. Such activity will help them to prepare a story in a pedagogical way, that highlights a relevant context, a rationale, and the intended learning outcomes.	PK – CK - PCK
# 2: Fundamentals of digital storytelling	The learning resources in this theme, are carefully designed and chosen to guide learners on the content. It also provides learners with improved possibilities to maximize the pedagogical benefits of storytelling as an educational method while improving other skillset that form part of the 21 st -century education models. The learning activity in	TK – TCK – TPACK

	<p>this theme is three-fold, and it helped learners to populate a glossary of terms related to digital storytelling, carry out a reflective exercise on the usefulness of digital storytelling in teaching and learning and develop a podcast to address an audience with appropriate tone and language.</p>	
<p># 3: Digital Storytelling as an innovative tool in the classroom</p>	<p>The learning resources in this theme, elaborate on how storytelling can be used to achieve intended learning outcomes using innovative tools. This approach contributes to technological improvements such as using authoring tools, video editing, and animation software. This allows the learner to focus on his or her creative thinking and abilities to develop engaging, interactive, and impactful stories. As such, the learner can master the content while developing the necessary technical skills to design pedagogical stories. The learning activity in this theme aims to allow learners to critically reflect on the use of digital storytelling as an innovative tool in the classroom.</p>	<p>TPK – PCK - TPCK</p>
<p># 4: <i>Design and Development of a digital story</i></p>	<p>The learning resources in this theme, engage learners in the process of designing and developing a digital story that can be integrated as part of a teaching practice session, using an appropriate tool. Guided tutorials were prepared to support and empower the learners with step-by-step instructions on the use of the different tools. The learning activity in this theme, allows learners to develop a storyboard and implement a digital story using a specific tool. As part of the assignment, they also developed a lesson plan to explain how they will integrate their digital story into a specific teaching session.</p>	<p>TK- TPK - TPCK</p>
<p># 5: Reflective Practice</p>	<p>This theme is based on a feedback activity, that was designed to allow learners to relate about their learning journey, the valuable insights they have gained, as well as the challenges they encountered especially in terms of integration of technology, pedagogy, and content. In this reflective activity, the learners’ perception of the pedagogical use of storytelling in the classroom for teaching and learning and its impacts on students’ engagement and learning experience was gathered.</p>	<p>TPCK</p>

Findings and Discussion

Overall Learning Experiences

From the feedback gathered, learners in general appreciated the level and types of tutor support throughout the course, especially when they had to manipulate new software and develop new digital competencies through semi-structured learning activities. Tutor support as reported by the learners related to the timely response to their queries, feedback on their submitted works, and online/face-to-face sessions as and when needed to clarify their issues. This aspect helped to boost their confidence levels, especially for those learners whose digital literacies were limited.

At the beginning, I did not choose Digital Story Telling as I was somewhat afraid of the word 'digital'...

...The different assignments were rewarding and have given me opportunities to develop several skills e.g., using different applications to do a podcast, to write a script, using PowerPoint presentations, or creating a digital story...

...I am not used to advancing digital tools, but I managed to overcome all these through 'trial and error' and with the help of the lecturer in charge of my group, who was ready to give quality support.

Learner A1 (Cohort 2020)

In terms of workload and learner effort, although there were some apprehensions from those who had limited digital competencies, they managed to complete the learning activities requiring the use of software tools in the time frame provided to them. This achievement in turn resulted in an overall feel-good factor and confidence for them to integrate such practices in their classrooms.

Prior to the start of this module, I thought that creating and using Digital stories in my classroom would require advanced technical knowledge... I can confidently state that I can create any Digital story... The online classes and our lecturer's guidance also helped me become a confident Digital Story creator.

Learner A2 (Cohort 2022)

The digital storytelling module was something that I was not so well versed in and was even a bit afraid of whether I would be able to complete all the necessary tasks given... The module brought me more than I expected, and I am glad to say that now I am more confident in the use and production of my own digital stories... Difficulties were overcome with the different tutorials given on how to do the digital story. These tutorials helped a lot in helping how to make the montage.

Learner A3 (Cohort 2022)

In general, learners expressed high satisfaction levels from the module, with some students suggesting that a few hands-on practical sessions could have accelerated the acquisition of practical skills as they spent quite some time searching for further help from tutors, peers, and

online resources to address their technical issues or blockages. However, they ultimately report to have managed to solve the issues which in turn improved their technological competencies.

Though self-instructional, my learning journey for this module has been very enriching. Notes and links provided on the Moodle platform and the guidance of the tutor were of great help. Support of peers is also crucial to overcome difficulties while using any software. We built on the experience of each other and finally, each one becomes savvier.

Learner A4 (Cohort 2023)

While practical sessions to teach learners how to use software step-by-step would have accelerated the process of knowledge transfer in terms of knowing what to do and how to do it, it would not have promoted the use of creativity by educators and the originality of their digital story designs. Such sessions tend to create a stereotyped process that everyone would follow to achieve the same output. As highlighted by Santally (2013) and Schneider (2003), the aspect of having “fuzzy edges” in activity-based learning helps to develop learners’ creativity and originality in the artifacts that they produce to result in an authentic and unique learning experience.

With Respect to TPACK Knowledge

The classification of the learner feedback from the records shows that most of the learners reported gains in technological knowledge followed by content knowledge and then pedagogical (content) knowledge. In the digital storytelling course, we considered pedagogical knowledge to include pedagogical content knowledge as well, in alignment with the course design approach. It is notable that technological content knowledge and technological pedagogical knowledge were the least developed skills as reported.

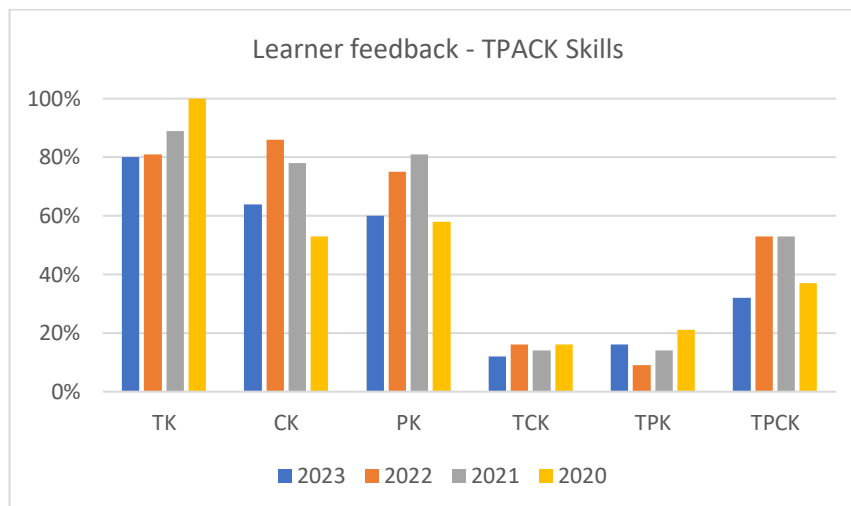


Figure 2: Skills and Competencies developed in the TPACK categories.

Overall, for all the cohorts merged, 47% of the processed feedback reported the development of TPACK skills. A similar trend was observed across the different cohorts.

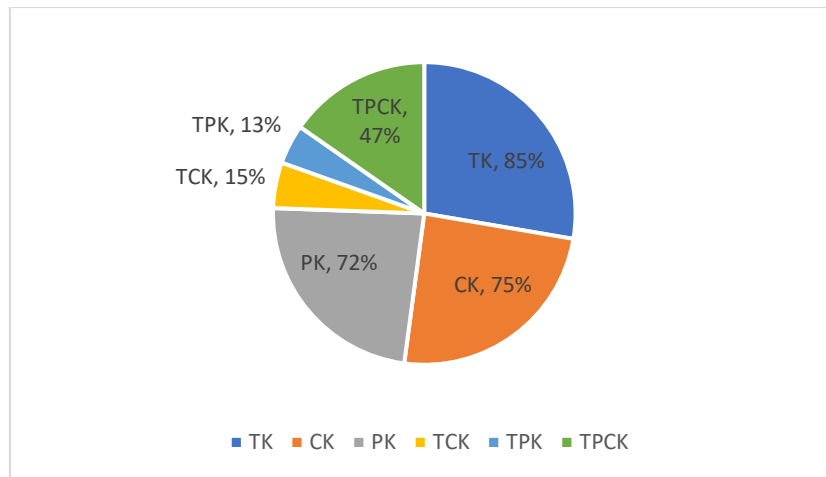


Figure 3: Overall reported TPACK skills development for all cohorts combined.

This consistency reveals that the type of skills and competencies that were acquired is most probably linked to the learning design approach of the course. Furthermore, we can observe that although the students acquired (as reported by them) technological knowledge (85%), content knowledge (75%), and pedagogical (content) knowledge (72%), it does not necessarily relate to the same level, in terms of knowledge gains, to the overall TPACK skills (47%). The relatively low reported gains in TPK (13%) and TCK (15%) may have an implication on the overall TPACK skills development. This finding and reasoning is in line with Santos and Castro (2021) reported that TPACK applications were primarily influenced by TPK and TCK with TPK exerting a higher influence on the applications of TPACK by pre-service teachers. Therefore, in line with Valtonen et al. (2019), our course design approach may need a rethink to focus on TCK and TPK if the overarching goal was to improve the TPACK skills of learners more significantly.

On the other hand, our findings differ significantly from Hofer and Grandgenett (2012) whose study revealed that participants developed significant TPK and TPCK while limited development in TCK. In our case, we noted similar but limited growth in both TCK and TPK which ultimately limited the growth of TPCK as compared to the individual growth in TK, CK, and PK. The difference may be explained due to the nature of the subject matter. Our course mainly focused on digital technology using the activity-based approach, while Hofer and Grangenett (2012) studied participants in different courses that formed part of a full-fledged master's in education course.

Conclusion

From this research findings, and drawing from the literature, we deduce that the development of educators' TPACK skills requires careful learning design for the conception of appropriate learning activities. TPACK skills may not be fully developed in one course only, but it may take a set of courses that are interlinked within the teacher training context where each course promotes the development of skills within one or more TPACK categories. The learning gains for the overall TPACK skillsets may then be more significant.

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