

Just-in-time Support for Teachers' Technology-infused Lesson Planning

Abstract

Teachers need support when integrating innovative technologies in their lessons. In this research, two types of just-in-time support for lesson planning were compared on perceived usefulness and effectiveness. Both types contained the same technological information but differed regarding pedagogical and content information. The first type of support presented this information elaborately and separately (i.e., separate support); the second type presented this information in a compact and integrated fashion (i.e., integrated support). Study 1 asked high school biology teachers (23 pre-service, 23 in-service) which type of support they would prefer. As expected, most in-service teachers chose the integrated support. However, most pre-service teachers also preferred this support, and argued that it could assist them in integrating pedagogy and content. Study 2 examined whether this conjecture holds true by comparing the lesson plans created by pre-service teachers who received either the separate ($n = 27$) or integrated support materials ($n = 26$). Results showed that pre-service teachers who used the integrated support had more integrated pedagogical and content-related justifications in their lesson plans than the group who received separate support. Both groups had few technology-related justifications. These findings confirm the alleged superiority of integrated support over separate support, and demonstrate that additional guidance is needed to help pre-service teachers to fully integrate pedagogical, technological and content information during lesson planning.

Extended summary

The internet has brought innovative technologies such as Java apps, cloud computing, and MOOCs within reach of most teachers. However, easy access to these applications does not guarantee their effective use in the classroom, and research has shown that teachers have a natural tendency to avoid novel resources unless they are guided adequately (Conole, 2007). This raises the question which type of guidance is effective and for whom.

The present research aimed to answer this question by investigating teachers' preference for and use of just-in-time support for lesson planning. The Technological Pedagogical And Content Knowledge (TPACK) framework was used as the basis for designing this support. TPACK asserts that teachers need knowledge of pedagogy, content, technology and their integration to successfully implement technology into their teaching (Mishra & Koehler, 2006). Support should therefore be adapted to teachers' knowledge of these three TPACK elements.

Although most teachers are unfamiliar with innovative technologies, and hence need extensive support on their use, experienced teachers have already integrated their pedagogical and content knowledge through professional experience (e.g., Gess-Newsome, 1999). For them compact and integrated pedagogical and content support may suffice, while for inexperienced teachers an elaborate and separate presentation of this support may be required. These assumptions were investigated in two studies that sought to find out what type of support in-service and pre-service teachers prefer, and whether this preferred support is actually effective in lesson planning.

Study 1: Teachers' preference for lesson plan support

Two types of support were developed that complemented a lesson plan for a secondary school biology unit. Both support materials offered the same elaborate information about the technology (modeling software) but differed with regard to the presentation of the content (glucose-insulin regulation) and pedagogy (inquiry learning). *Integrated support* presented this information in a compact and integrated manner, and was expected to be preferred by in-service teachers. *Separate support* presented pedagogical and content information separately and elaborately, and was expected to be preferred by pre-service teachers.

To examine teachers' support preferences, 46 biology teachers (23 pre-service and 23 in-service) were asked to read the lesson plan and support materials and decide whether they would prefer the integrated or separate support when preparing the lesson.

Analysis of teachers' responses focused on their preference for one of the two support materials, and the justifications underlying their decision. Results showed that a majority of both the in-service (73%) and pre-service teachers (65%) preferred the integrated support, and teachers' choice of support proved to be independent of their professional experience, $\chi^2(1, N = 46) = 0.41, p = 0.52$. However, qualitative analyses revealed notable differences between pre-service and in-service teachers' justifications regarding the integrated support. As predicted, in-service teachers preferred this integrated presentation format because it matched their teaching practice. In contrast, pre-service teachers favored this presentation format because it supported them in what they considered the challenging process of integrating pedagogy and content in practice.

Study 2: Effectiveness of TPACK-based lesson plan support

Having established teachers' support preferences, this study addressed the effectiveness of integrated support during pre-service teachers' lesson planning. Using the same support materials as in Study 1, a controlled experiment was conducted with 53 pre-service biology teachers who either received the integrated ($n = 26$) or separate support ($n = 27$). They were asked to use the support materials to design a lesson and justify their decisions.

Pre-service teachers who received integrated support were expected to include more justifications wherein pedagogy and content were presented in an integrated fashion (i.e., PCK-related statements) than pre-service teachers who received separate support. The integrated support could bootstrap further TPACK integration, but as both groups were not supported on the integration of technology specifically it is likely that pre-service teachers do not differ in amount of TPACK-related justifications between conditions.

To test these hypotheses, pre-service teachers' lesson plans were analyzed by first classifying the content of their lesson plans as either factual information or justification, and hereafter, coding the justifications on (1) the integration of pedagogy and content, and (2) the integration of technology with pedagogy and content.

In correspondence with our first expectation pre-service teachers who received integrated support included a higher percentage of PCK-related statements ($M = 51.56$, $SD = 27.48$) than pre-service teachers who received separate support ($M = 37.97$, $SD = 22.93$), $U = 216.00$, $z = -2.06$, $p = .04$, $r = -.29$. Regarding the percentage of TPACK-related statements the integrated support condition ($M = 14.78$, $SD = 23.98$) did not significantly differ from the separate support condition ($M = 9.61$, $SD = 17.29$), $U = 293.50$, $z = -.67$, $p = .51$. This confirms that integrated support does not lead to more integration of technology with pedagogy and content. Additional analysis of the quality of the lesson plans is currently ongoing.

Conclusions

The results of both studies point to one important guideline for the support of pre-service teachers in their technology integration process. Most pre-service teachers preferred support beyond their TPACK starting position, and the use of this integrated support proved to enhance their integration of pedagogy and content in lesson planning. Thus, instead of addressing pre-service teachers' current knowledge base, support should be geared toward 'the next level' and assist pre-service teachers in integrating the separate TPACK pillars.

To engage teachers in full technology integration additional support is required. Integrated PCK support could function as the basis for teacher guidance specifically aimed at the integration of technology with pedagogy and content.

References

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